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Ore Dressing in the Coeur d'Alene District—I

Mining Dates Back to 1879; Bunker Hill & Sullivan Discovered in 1885. Geology of the Region and Nature of the Ores Treated

BY EDWARD S. WIARD*

All the important silver-lead mines of the Coeur d'Alene district are situated in an area of about 45 sq. miles. A square 6 miles on a side would cover all the important mines of the Canyon creek, Nine Mile creek and Mullan districts, and a square 3 miles on a side would amply cover all the mines in the vicinity of Wardner. The two rectangles are approximately 10 miles apart.

The present series of articles deals only with the metallurgical practice of the silver-lead mills of the mines in the rectangles mentioned. Lead ore has been found as far north in the district as Murray but the discoveries there as well as elsewhere outside of the two quadrangles mentioned are of minor importance. Copper ore of merchantable grade is mined in the Snowstorm mine. Gold quartz is mined and milled in the vicinity of Murray. An accompanying map shows the properties of the various companies in the district.

BUNKER HILL MINE IN COEUR D' ALENE DISTRICT, IDAHO

The Federal Mining and Smelting Company

The first mining work done in the district was begun in 1879 on the gold placers near Eagle. The Paymaster, the first gold-quartz claim in the district, was located Sept. 21, 1883. From the gold area near Murray, where these locations were made, prospectors drifting into Canyon creek and the adjoining streams made important discoveries of silver-lead veins and by 1885 nearly all the principal mines in this area had been located. The great

*Mining engineer, Denver, Colo.

Bunker Hill & Sullivan mine at Wardner was discovered in 1885. By 1887 a narrow-gage railroad had connected Coeur d'Alene lake and river with Wardner and Wallace. The main line of the Northern Pacific railway skirts the northern end of the lake and the two railways were connected by small steamers. By 1890 the Northern Pacific railway had built a branch from the east to Wallace and the Oregon Railway and Navigation Company a branch to the same place from Tekoa on the west. The important Hercules mine was not discovered until 1901.

In 1903 the Federal Mining and Smelting Company was formed, absorbing the Empire State-Idaho M. and D. Company, of which the old Last Chance Mining Company was the nucleus, and the Standard and Mammoth mines as well as the Tiger-Poorman at Burke. In 1905 the Federal Company acquired the Morning mine near Mullan from Larson and Greenough. The Tiger-Poorman mine is now called by the Federal company the Burke mines. The Standard and Mammoth are designated as Mace mines 1 and 2, and the Last Chance mine as the Wardner mines. The old names are the ones most commonly used in the district.

A detailed account of the development of the district may be found in Professional Paper 62, U. S. Geol. Survey, "The Geology and Ore Deposits of the Coeur d'Alene District, Idaho," to which I am indebted for a number of the facts given above and for many of the geological statements which follow.

Geology of the District

To the casual observer there are only two distinct rock formations in the district. A dark-blue slate containing noteworthy amounts of iron pyrites and occupying the northern and western portion of the district, and paler, less cleavable sedimentaries occupying the central and southern portions of the area. In these last rocks occur all the important silver-lead mines. In Professional Paper 62 six formations are noted and to the oldest, the dark-blue slate mentioned above, has been given the name "Prichard formation." The majority of the important mines occur in pale gray or greenish quartzites, argillites and graywackes of the Revett and Burke formations. The region is much folded and faulted, the bedding planes presenting edges at a high angle everywhere. Topographically the region presents a plateau sloping gently westward from the crest of the Bitter Root range on the line between Idaho and Montana and deeply eroded by stream action.

The veins may be described as shear and crush zones occurring in silicious and argillaceous sediments of probably Algonkian age. With the exception of the Bunker Hill-Last Chance fissure the veins are nearly vertical. One wall and occasionally both are lacking. The Bunker Hill-Last Chance lode has a well defined footwall with a dip of 38 deg. It is possible that in depth ore may be found below this wall in the footwall country. In the Morning and You Like veins which are separated by about 1000 ft. of barren country rock, parting planes free from gouge are found near the veins but do not appear to have any distinguishable genetic connection with them. The Hunter mine has three shear zones or veins and these are supposed to be a continuation of the You Like shear zone.

The Morning Vein

The Morning Vein is shown in section in Fig. 1 of an accompanying drawing. The structure represented is typical also of the Hunter-You Like lodes. The section is drawn to bring out the metallurgical features of the vein or the difficulties encountered in milling the ore owing to the mode of deposition. The vein cuts the sedimentary formation at a slight angle on the dip and is nearly vertical. The quartzite partings shown in the section are the shattered and metasomatically replaced remnants of the country rock. The ore occurs in vertical shoots of as great a length as 1800 ft. and gradually fades out in the hanging- and footwalls. The economic width of the ore is from 3 to 40 ft. The section shows a portion of the horse inclosed by the vein. The quartzite partings have been exaggerated to show more clearly the structure of the vein. The ore is a dense fine-grained mixture of sulphides, chiefly galena and iron pyrites, accompanied by a gangue of siderite and minor amounts of quartz. As at Wardner the siderite has metasomatically replaced the shattered quartzite and the gangue in turn has been replaced by sulphides.

The problem of the mill is the prevention of lead losses on the jigs from pieces of quartzite lightly impregnated with siderite and sulphides, and the commercial separation of the fine-grained mixture of lead and iron sulphide. The ore contains but little zinc. Owing to the nature of the ore, sorting is not attempted. As sent to the mill the ore contains about 9 per cent. lead and 2 to 3 oz. silver. For every per cent. lead there is 0.33 oz. of silver. Owing to the large content of iron pyrites the mixed sulphides have a grayish appearance and are heavier than any ore broken in the Federal Company's mines. It is interesting to note in this connection that the streak of pure galena is navy blue and not blackish gray as reported in the textbooks.

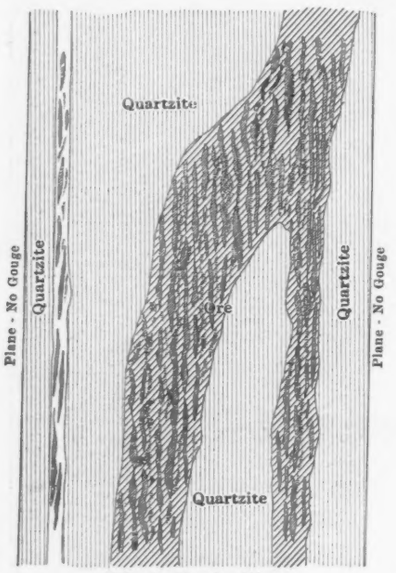

FIG. 1, Morning Mines

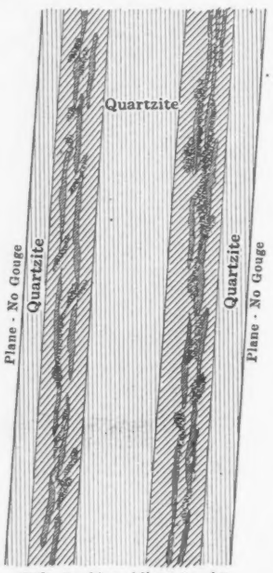

FIG. 2, Mace Mines 1 and 2

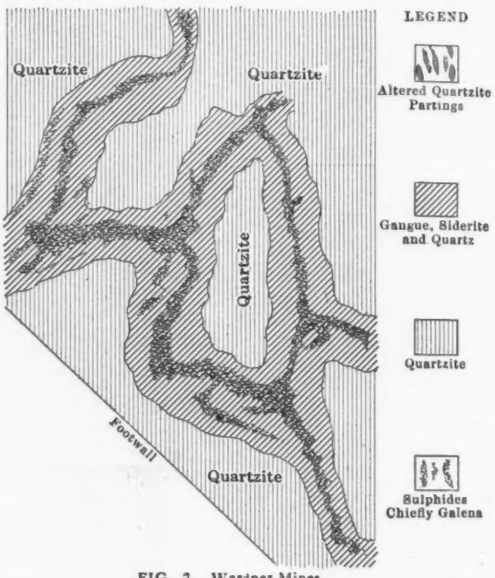

FIG. 3, Wardner Mines

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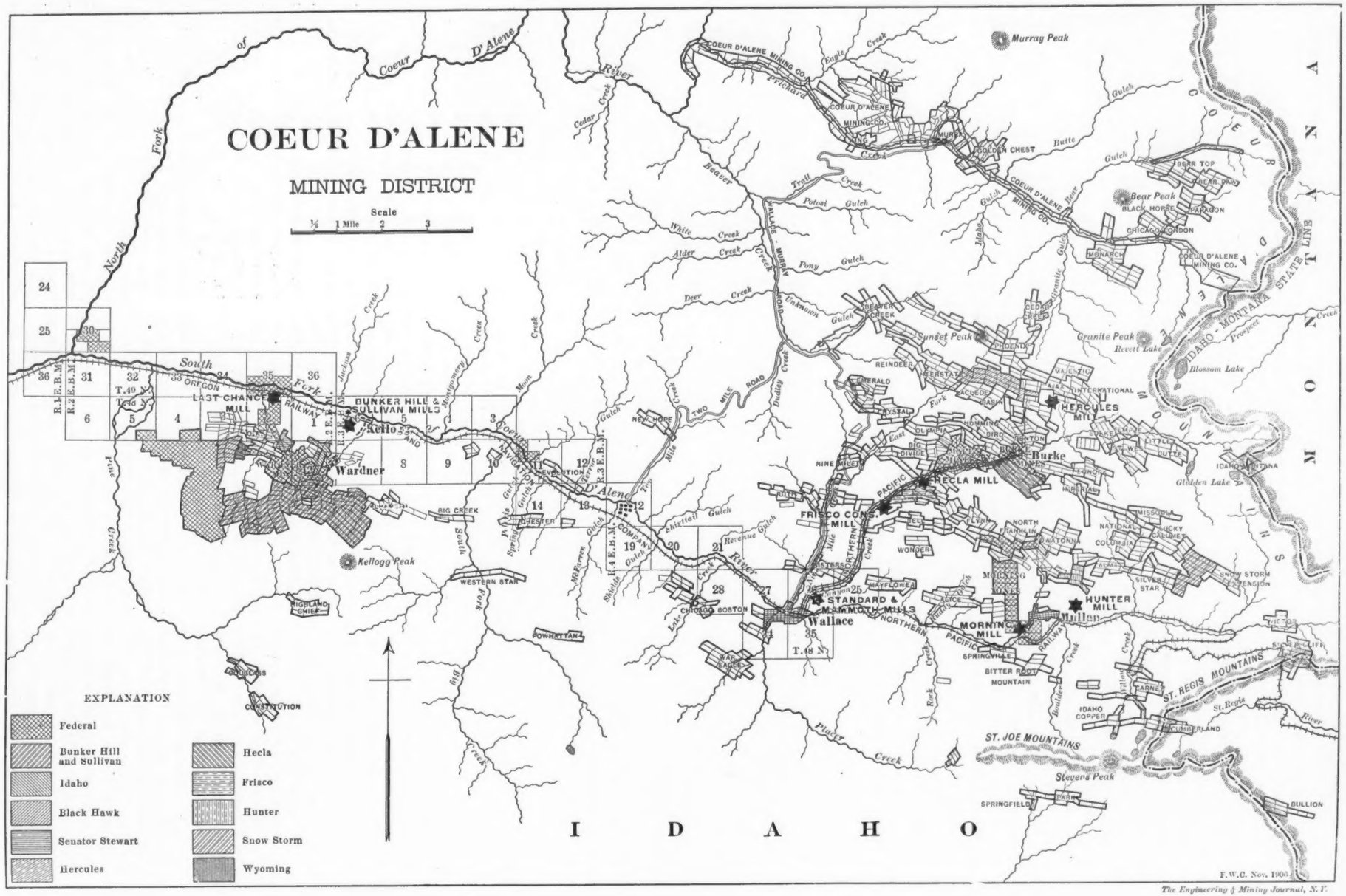
TYPES OF VEIN FILLING IN COEUR D' ALENE DISTRICT



MAP OF THE COEUR D'ALENE MINING DISTRICT SHOWING SITUATION OF MILLS AND PRINCIPAL MINES

The Frisco-Consolidated company's claims are located on the supposed continuation of the Morning and Hunter veins. The Frisco mine was at one time a famous producer but owing to the impoverishment of the orebodies and the increasing amounts of zinc found with depth it was forced to close down. During a portion of 1907 and after some changes had been made in the mill it was operated more for the zinc than the lead contained in the ore. Toward the end of the year owing to the decrease in the price of spelter it was once more forced to close, but operations will probably be resumed when spelter again advances in price.

The Black Bear vein appears to be on the same line of fissuring as the Gem and Frisco veins, but is separated from the latter by a considerable horizontal displacement due to faulting. The ore in these veins does not, however, show any resemblance to that of the Black Bear vein. The ore of the latter vein is a very pure galena and there is little or no evidence of metasomatic replacement of the wall rock, the vein being a simple filled fissure. When this ore was treated years ago at the first Morning mill no difficulty was experienced in obtaining a high extraction of the lead and silver.

The Standard, Mammoth and Hecla Vein

The Tiger-Poorman mine, once a famous producer and with a shaft over 2000 ft. deep, has been shut down for a considerable period and resumption is problematical. The Standard, Mammoth and Hecla properties are located on the same vein, the Hecla portion being separated from the remainder by a fault. In the Hecla mine a greenstone dike younger than the vein accompanies it. The vein, which is a shattered zone, occurs on one or both sides of the dike and dips about 70 deg. There is little metasomatic replacement of the wall rock and but little siderite in the gangue. The ore contains little sulphide other than galena. In places between the quartzite partings the galena is 2 ft. wide. The ore is readily amenable to wet concentration. Considerable amounts of first-class ore are sorted out at the picking plant in the shaft house.

A section of the Standard-Mammoth vein is shown in Fig. 2. of the illustration. As in the case of the section of the Morning vein the quartzite partings are exaggerated. No footwall or hanging-wall proper exists. A slightly mineralized plane accompanies the vein, sometimes on one side, sometimes on the other, and occasionally in the center of the vein. There are usually two shear streaks which may be designated the foot- and hanging-wall streaks. As at Mullan the ore fades out in the country rock. The structure of the shear streaks is similar to the Morning vein but there is less metasomatic replacement, less siderite and considerably less iron pyrites. On the other hand the ore contains more zinc. Some trouble is experienced on the middlings jigs with zinc, but on the whole the ore yields well to wet concentration. As in the other mines in Canyon creek the ore shoots are vertical. The merchantable ore is from 5 to 15 ft. wide.

Zinc Saved at Success Mine

The Hercules mine is still in the zone of oxidation. The ore contains zinc but not in troublesome amounts. At the Success mine, formerly the Granite, the ore occurs in quartzite which has been intruded by a mass of monzonite. Ransome and Calkins regard this ore as formed by pneumatolytic action from the igneous rock. The ore is very zinky and the outlines of the orebodies irregular. A number of minerals assigned to pneumatolytic action are found associated with the ore. The ore is mined and milled principally for the zinc content.

It is an undoubted fact that the orebodies of the district become more base with depth. Ransome and Calkins regard the monzonite, large masses of which are exposed in Canyon creek, as the source of the ore in all the mines. Increase in zinc with depth is met in all the Canyon creek mines. Ultimately it may be expected all the mines will in depth reach conditions somewhat similar to those in the Success mine. With the exception of the Success Company none of the mines attempt to make any saving of the zinc, it not being thought possible to make a saving in the present state of the art of ore dressing. In time zinc may assume great importance in the district.

At a depth of 1900 ft. in the Bunker Hill & Sullivan there is no change in the character of the ore. The ore in this mine is, however, in a higher horizon than those of Canyon creek at present. The Standard-Mammoth ore is slowly becoming more zinky. As example of the percentages of zinc in the milling ore and mill products the following figures may be cited: The Last Chance jig concentrates contain about 2.5 per cent. zinc to 60 per cent. lead. The slime concentrates, being lower in grade, contain of course a larger proportion of zinc. The milling ore contains less than 1 to 8 or 10 per cent. lead. The Standard-Mammoth milling ore or "feed" contains about 2 per cent. zinc to about the same amount of lead as the Last Chance "feed," and the jig concentrates about 5 per cent. zinc to 50 per cent. lead.

The Mines at Wardner

At Wardner are the Bunker Hill & Sullivan and the Last Chance mines, both mines on the same vein or zone. Briefly the vein can be described as a shattered zone of quartzite of great width, the shattered rock being replaced by siderite and sulphides on a gigantic scale. There is a footwall marked with gouge below which so far no ore has been found. The strike of the footwall is northwesterly and the dip 38 deg. to the southwest. The ore gradually fades out in the hanging-wall and profitable bodies of ore are found as far out as 300 ft. in a horizontal direction from the footwall. The ore occurs in masses of irregular shape which sometimes follow the course and dip of the bedding and more frequently break across it. These irregular masses form great shoots which in the Bunker Hill mine have a northwesterly pitch.

The course of the Jersey shoot in the Last Chance mine is nearly at right angles to the course of the footwall and has a southeasterly pitch. Fig. 3 of the accompanying illustration illustrates the mode of formation of the orebodies. The quartzite has been replaced by siderite and this by sulphides. In these iron, zinc and other elements except lead occur sparingly, over 90 per cent. of the ore hauled to the mills being quartzite, siderite and galena. In places the sulphides replace the quartzite directly, while in other places in the mines veins of pure siderite occur with little or no metasomatic replacement. These variations are not, however, a very marked feature of the deposition.

The center of the seams is usually nearly pure galena. At the confines the content of spathic iron increases and finally the ore consists of a mixture of quartzite and siderite, the latter having replaced the former, and in this groundmass are wiry and arborescent masses of galena. The tracery of the galena in the sideritic quartzite is often the most delicate imaginable, the limbs of deposited galena being often of hair-thickness and finer. It is this phenomenon which makes the Wardner ores the most difficult to treat by wet concentration of any in the district. It is diffiult to prevent the escape over the tail boards of the jigs of material containing wiry patches of galena and having, with its associated gangue, but little greater specific gravity than the pure siderite or sideritic quartzite which it is desired to send to waste.

Low-grade Middlings at Wardner

The bulk of the jig middlings consists of siderite associated with this metasomatic galena. This material on being reground and returned to the direct stream of ore passing to the Wilfleys and vanners for treatment, materially increases the content of carbonate of iron. On the Wilfley tables noteworthy amounts of lead are lost in the form of middlings sand, the bulk of which is siderite. In the Wardner mills this is regarded as practically worthless and goes to waste. On the vanners, owing to the spathic iron, it is impossible to obtain a clean concentrate

without heavy loss, and the practice at the Wardner mills is to make a low-grade concentrate, the amount of lead in the fines shipped being increased by adding to the vanner concentrates a high-grade concentrate from the Wilfley tables, or to redress the vanner concentrates on Wilfley tables.

During the year ending May 31, 1907, the Bunker Hill & Sullivan Company shipped a middlings product from their jigs which amounted to over 13 per cent. by weight of the total ore shipments, but represented only about 2½ per cent. of the total value of the products shipped. The sale of this product was made possible by a low freight and treatment rate and the iron excess. The master shoots of the Bunker Hill-Last Chance lode occupy the whole width of the lode. Large masses of nearly pure galena are of frequent occurrence. During the year ending May 31, 1907, the crude ore obtained by sorting in the Bunker Hill mine amounted to 13.6 per cent. of the gross value of the total shipments.

The percentage loss in silver is greater than the lead loss in all the Coeur d'Alene mills. As in other camps, the reason for this may be found in the mode of deposition of the ore, the character of the associated minerals, or both. In most districts employing jig and table concentration to separate base sulphides from contaminating gangue and from one another, a greater loss in silver than in lead is due to the association of the silver with base sulphides of lower specific gravity than galena. Such is not the case in the Coeur d'Alene district for the sulphides other than galena contain but traces of silver or none at all.

At the Last Chance mill the jig middlings not infrequently used to run up to as high a ratio as 2½ oz. silver to 1 per cent. lead, whereas the original ore fed to the mill contained but 0.4 oz. silver. to 1 per cent. lead. The feed to the Wilfley tables and vanners contained a higher ratio of silver to lead than the original ore, but lower than the jig middlings owing to the admixture of the middlings after regrinding with the fine portions of the stream of original ore passing down through the mill. Such a condition is bound to show a greater loss of silver for the whole mill even if it is admitted that the lead and silver concentrate with equal losses on the jigs and equal losses on the slime tables, though with a greater loss in the latter department as the following figures will illustrate.

Ratio between Silver and Lead

I will assume for argument that the ore as fed to the mill contains 8 per cent. lead and 3.2 oz. silver, this being a ratio of 0.4 oz. silver to 1 per cent. lead. In 100 lb. of the milling ore there would then be 8 lb. lead and 0.16 oz. silver. I will assume that 5 per cent. of this amount, or 5 lb., passes directly to the Wilfley tables and vanners, and of the remaining 95 lb., 10 per cent., or 9.5 lb., represents the weight of jig middlings. Assuming the extreme ratio given above, I will assign as the assay value of the middlings 12 per cent. lead and 18 oz. silver.[1] The material left available for jig concentrate or tailing weighs 85.5 lb. and contains 6.46 lb. lead and 0.066 oz. silver. The sands and slimes contain 0.008 oz. silver and 0.4 lb. lead from the 5 per cent. of original feed which passed directly to the tables and vanners, and 0.086 oz. silver and 1.14 lb. lead from the jig middlings which are added to it, making a total of 0.094 oz. silver and 1.54 lb. lead fed to the tables and vanners. If a saving of 60 per cent. is assumed on the tables and vanners and 75 per cent. on the jigs, the extraction of lead and silver in each department being considered equal, the total saving in the mill will be 1.02 oz. silver and 5.77 lb. lead per 100 lb. of lead ore, or about 72 per cent. of the lead and 66 per cent. of the silver. The common silver mineral in the district is argentite and it is so closely associated with galena that it is seldom or never seen as a separate mineral aggregate. The presence of tetrahedrite in the ores of the district is another source of silver loss. During some tests made by me with salt and Russell solutions at the Last Chance mill the ratio of silver in argentite form to that in tetrahedrite form in the slime tailings was found to be 3 to 1. Silver-bearing tetrahedrite occurs in all the ore of the district, though very sparingly in some of the mines. I am inclined to believe that there is a greater proportion of silver in tetrahedrite form in the Wardner mines than elsewhere in the district, and that at Wardner it is more associated with the wiry or metasomatic forms of galena than with the galena in the center of the fissures. Some tetrahedrite occurs separately, as notably in the Jersey shoot of the Last Chance mine, but as a rule it occurs so closely bound up with galena as to be undistinguishable from it.

[1]The reason for the high lead content assigned to the jig middlings will be explained in a later article of this series under "Jigs and Jigging."

TIGER-POORMAN SURFACE PLANT

STANDARD-MAMMOTH OPERATION

Increase of Silver Content in Metasomatic Zones

If we consider that the ratio of silver to lead is higher in the metasomatic zones adjacent to the center of the fissures which have been filled with galena ore of a high grade, we will have an explanation of the high silver content of the jig middlings. The metasomatic material is to a large extent spathic iron or sulphides mixed with spathic iron, and of a specific gravity midway between quartz and quartzite and galena.

At the Last Chance mill for a period of about two years the jig concentrates contained about 60 per cent. lead and between 23 and 24 oz. silver. During the same period the slime concentrates con-

tained on an average about 48 per cent. lead and nearly 23 oz. silver. In the first case there would be a ratio of something under 0.4 oz. silver to 1 per cent. lead, and in the second 0.48 oz. silver to 1 per cent. lead.

At the Standard-Mammoth mills for about two years the jig concentrate contained on an average 50 per cent. lead and 40 oz. silver, and the slime concentrate for the same period about 47 per cent. lead and 32 oz. silver. The ratio of lead to silver is about the same in both products and this might lead one to suppose that the jig and slime losses in silver were about the same percentage, but this is merely a coincidence, the feed being richer to the Wilfley tables and vanners and the silver losses being such as to leave the ratio unaltered. Also, as compared with the Bunker Hill or even the Morning vein, the amount of siderite and metasomatic replacement in the Standard-Mammoth lode is small. In the three mill products shipped by the Bunker Hill & Sullivan during the year ended May 31, 1907, the ratios were as follows: First-class concentrates, 0.4 oz. silver to 1 per cent. lead; middlings, 0.46 oz. to 1 per cent. lead; slime concentrates, 0.43 oz. to 1 per cent. lead.

SEQUENCE OF SUBHEADS IN FOLLOWING ARTICLES

The description of the milling methods will be taken up in the following order: (1) Transportation of ore to mill; (2) ore sorting; (3) general description of mills and milling processes; (4) mill framing and foundation; (5) bins and gates; (6) conveyers; (7) breakers; (8) rolls and accessory apparatus; (9) elevators; (10) trommels and screens; (11) jigs and jigging; (12) roller mills; (13) classifiers, classifying and settling tanks, outdoor settling tanks; (14) Wilfley tables and vanners; (15) launders; (16) water used in concentration; (17) zinc; (18) sampling and assaying; (19) loading concentrates; (20) tailings retreatment; (21) résumé.

Scattered through the text of the articles which have just been enumerated, and also in the form of dissertations at the end of some of them, will be found criticisms of the devices and ends used to effect concentration in the district. These criticisms are in no manner comparable to those which would appear in an engineer's report. If a machine in a mill is wrong in principle or out of date, etc., the question as to whether it should be removed and replaced by something better will often, if properly considered, lead to a remodeling of a group of machines or the whole mill, and improvements must be decided upon by the engineer after he has become acquainted with the financial and other policies of the company employing him and has measured the effect of such changes and their cost. I do not pretend to so complete a knowledge of the mills of the district. There are, however, many milling devices and methods employed in the district which are common to concentration mills all over the continent and which, though faulty or inferior, are being put into service in even the latest mills. I believe that some good will result from pointing out such devices or methods. I have made the drawings which accompany the sections from measurements taken in the mills.

Homestake Mining Company

The annual report of the Homestake Mining Company for the fiscal year ended May 31, 1909, shows a small increase in the tonnage milled over that of the preceding year. The grade of ore was also higher. The company crushed 1,505,302 tons for a bullion return of $5,725,047, an average yield of $3.803 per ton.

The report contains the statement of receipts and disbursements, the tonnage

OPERATING STATEMENT.

	Amount.	Per Ton Milled.
Proceeds from bullion	$5,725,047	$3.803
Foundry and miscellaneous	140,607	0.093
Total receipts	$5,865,654	$3.896
Mining expenses	$2,636,993	$1.752
Milling expenses	844,990	0.561
Deadwork	6,550	
Foundry and miscellaneous	176,793	
Tramways	30,774	
Water	86,152	
Office and general	171,906	
Bullion freight	10,236	
Taxes	81,772	
Total operating	$4,046,166	$2.687
Net earnings	$1,819,488	$1.209

milled, and a brief statement of the superintendent. Only a general estimation of costs can be made from this information, and the accompanying tables, compiled from the financial statement of the secretary, summarize the items given. No mention is made of the tonnage mined or ore reserves. It is to be regretted that a mine of the prominence of the Homestake

INCOME ACCOUNT.

Net earnings	$1,819,488
Balance from previous year	443,918
Total	$2,263,406
Timber lands	$60,602
Slimes plant construction	70,847
Property purchase	7,447
Spearfish plant	82,121
Dividends paid	1,365,000
Total payment	$1,586,017
Balance at close of year	$677,389

should not issue a report containing more than a mere statement of profit and loss.

Work has been begun on the new hydroelectric power plant on Spearfish creek, about 12 miles from Lead. More than four miles of this work will be by tunnel. The completed installation will cost approximately $1,000,000, and will require 18 months' time. It will reduce the charges for power materially. The whole cost for this plant is to be borne by the treasury without diminution of the dividend rate. During the year 10,741 ft. of drifts, 567 ft. of raises and 262 ft. of vertical shafts were excavated.

Mining in Southwest Virginia

SPECIAL CORRESPONDENCE

None of the zinc or lead mines in southwest Virginia are in regular operation at the present time. Some zinc ore is being gleaned from the old Bertha workings and run through the soft-ore mill at Austinville, in Wythe county. The oxide furnaces of the Bertha Mineral Company, at Austinville, are being run on Bertha tails or "buck fat" ore dug from the bottom lands below the old mill.

Experimental work is still being carried on at the hard-rock mill pending the results of which the mines are idle. The problem at Austinville is to concentrate the disseminated zinc-lead sulphide ores with a reasonable recovery. G. M. Hicks is superintendent and W. O. Borcherdt, under whose immediate supervision the milling work is being conducted, is assistant superintendent. The company's zinc furnaces at Pulaski are being run, more or less continuously, chiefly on galvanizer's scrap and oxide from Austinville.

The Pulaski Mining Company is opening a large body of pyrrhotite near Chestnut Yards, in Carroll county, 50 miles from Pulaski. The company has had a core drill at work here for over a year. The mine, which is being worked as an open cut, supplies from four to six 30-ton cars daily to the company's sulphuric-acid plant at Pulaski. Possibly owing to the fact that the furnace of the Pulaski Iron Company is closed down for repairs there is quite an accumulation of the iron cinder at the acid plant.

The ore mines of the Pulaski Iron Company on Cripple creek are also closed down pending repairs of the furnace. The Dora furnace of the Virginia Iron, Coal and Coke Company, at Pulaski, is in blast; the Max Meadows furnace is idle. This company is conducting a number of soft-ore operations, and has several furnaces, including a couple of charcoal ones, in full blast. The Ivanhoe Furnace Company is working the Davy Crockett soft-ore mine of the Bertha Mineral Company on a royalty basis, and has put in a narrow-gage railroad from the mine to its furnace at Ivanhoe, in Wythe county, a distance of about four miles.

It is generally conceded that the available supply of soft ore from the region between Galax and Pulaski is becoming limited and that the furnaces will soon have to look elsewhere for their iron ores. The proposed extension of the Norfolk & Western beyond Galax into North Carolina would tap a rich mineral region which could supply large quantities of ore.

The Roosevelt Deep Drainage Tunnel, Colorado

Rapid Progress Made; Methods of Mining and Blasting; All Drainage Tunnels in the Cripple Creek Mining District Have Been Successful

BY RUFUS M. BAGG, JR.*

The country rock through which the Roosevelt drainage tunnel in the Cripple Creek district has already been driven more than two miles, is entirely of biotite-granite gneiss. In places the gneissoid character is pronounced and the foliation reveals itself in streaks and layers of biotite, roughly parallel, but never becoming strongly schistose. The pink orthoclase crystals are often porphyritic and occasionally attain a diameter of 2 to 3 in. Biotite and quartz form the holocrystalline ground mass of these large feldspars. Other minerals are present, as in typical Pike's peak granite, but the formation is very massive, homogeneous and more uniform in texture throughout the entire workings than the fine-grained granite type.

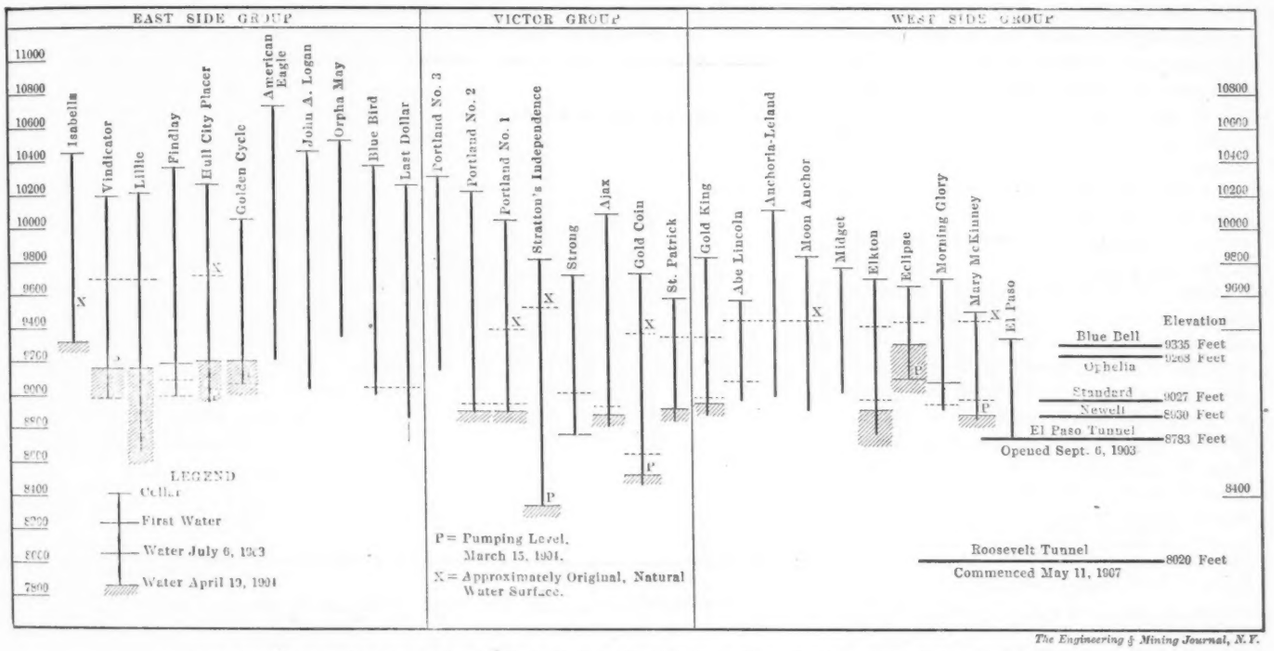
This coarse-grained granite forms the major portion of the broad plateau stretching southward from Cripple Creek, but the fine-grained granite becomes prominent in the region cut by the cañon of East Beaver creek. The same gneissoid character is well exemplified in Eight Mile cañon, where it shows the relationship to the massive granite. At the time of my visit (Aug. 25, 1909) the drainage tunnel had just crossed a small fissure through whose gaping walls a small stream of water is now flowing. Save for this recent flow, which probably marks the beginning of the drainage of the district yet to come, the tunnel workings are dry and the granite is exceptionally massive for gneissoid types and has but few joint planes.

High Explosives Used

The abundance of biotite (black mica) in the rock renders the granite elastic, and this elasticity interferes with the breaking of the rock. The method of overcoming this difficulty is to increase the per cent. of nitroglycerin in the blasting powder, and also to add gun cotton. Such an explosive shatters the rock much more effectively than the ordinary dynamite used in mining. A. S. Pearce, the superintendent, informed me that he was using powder composed of 92 per cent. nitroglycerin and 8 per cent. gun cotton. This compound he found the most satisfactory explosive for gneissoid granite. This explosive is used in the center cuts while lower-grade powder, some containing 40, some 50 and some 60 per cent. of nitroglycerin, is used for the balance of the ground.

The tunnel is 10 ft. wide and 6 ft. high, with the roof and sides well squared up throughout. The intermediate shaft is 697 ft. deep, and was sunk in solid granite from top to bottom. It hits the tunnel exactly, and from the bottom Mr. Pearce drove breasts both ways, to the south to meet the adit and to the northwest to cut under Beacon hill and into the Cripple Creek mining area. The junction of the two headings (the adit being driven in conjunction with the intermediate south drift) was made after the bore had extended about 2000 ft. south of the intermediate shaft. It was found that the alinement was exact and grade perfect, the junction being so accurate that unless one examined the direction of the drill holes it would be impossible to find where the two headings met. The grade of the tunnel has been kept as low as possible, with just slope enough to carry the water toward the adit. This is 3 in. in 100 ft. (¼ per cent.).

Leyner drills are used and have been found satisfactory; they drill rapidly and do not get out of order readily. They use hollow drill steel, and water is fed to the cutting edges. The holes are 2½ in. in diameter at the collar and 1½ in. at the bottom; the depth is from 7 to 9 ft. Two men are required to run each large machine used in the heading, and three eight-hour shifts are employed. The ventilation of the tunnel is remarkably perfect, and is maintained by a 2-ft. pipe laid on the right side of the tunnel floor. The smoke from a blast in the tunnel breast issues from the tunnel shaft in about three minutes after traveling about 3000 ft. horizontally. All waste rock is now hoisted through the intermediate shaft. The



RANSOME'S DIAGRAM OF WATER LEVELS AND DRAINAGE TUNNELS IN THE CRIPPLE CREEK DISTRICT

*Geologist, University of Illinois, Urbana, Ill.

buckets are automatically dumped into an ore car, and only one man is required at the surface to remove all the waste lifted from below. A 3x6-ft. waterway is cut in the tunnel by a separate machine on the side opposite the track.

Time Required to Drain District

At the present writing the tunnel breast is directly under the summit of the first hill south of Beacon hill and between Gold and Arequa gulches. This tunnel ought to strike the phonolite plug of Beacon hill about 2000 or 2500 ft. farther on. When the tunnel strikes this dike or plug and enters the volcanic zone to the northeast, the drainage of Cripple Creek mines will begin but it will require time to drain the district at so great a depth. It is thought that the tunnel will be finished within the next eight or nine months, and, unless some unforeseen difficulties arise in the work, it is likely to prove a record for this size tunnel in granite rock. The accompanying diagram shows the relative position of the bore holes used by Mr. Pearce in breaking ground at the breast of the tunnel, the numbers indicating the order of blasting. Twenty-six holes are drilled and these are so directed and fired that much of the waste is thrown to one side as it breaks, greatly facilitating its quick removal while the next shift is commencing operations.

Since the above was written the report of the boring for August and September has reached me, and Mr. Pearce states that his average during 10 months is 361 ft. 4 in. per month. During the month of August he made 410 ft. This distance was drilled in spite of the fact that he lost 56 hours from the disabling of the electric plant, through washouts down the creek. In September, with a loss of 108 hours, he drove the heading 399 feet.

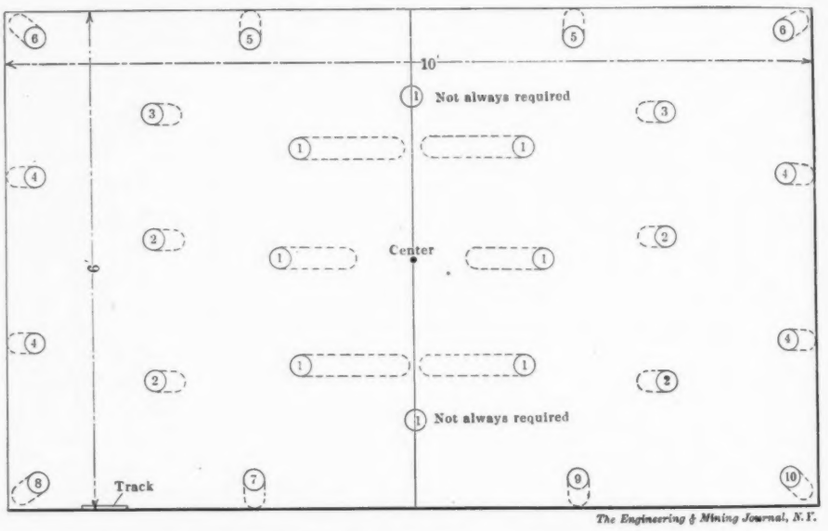
Other Tunnels

In conclusion, a brief statement of the existing tunnels of Cripple Creek may be interesting. Every tunnel driven in Cripple Creek for drainage purposes has been a success. This is also true of other tunnels of the district not driven for drainage purposes; for example, the Blue Bell tunnel, which was the first in the district. Its adit was in granite at an elevation of 9335 ft. above sea level and about 15 ft. below the original water level of the region. The tunnel had a maximum flow of 200 gal. per min., and the flow continued for several years.

The Ophelia tunnel, cutting the granite at the west base of Gold hill, has an elevation of 9268 ft., and when 2600 ft. in length is reported to have had a flow amounting to 2100 gal. per min. According to Lindgren and Ransome's latest report on the geology of the Cripple Creek district, this tunnel water came entirely from breccia in fissure zones connected with the main volcanic neck. This tunnel became dry in 1898 with the drainage of the Standard tunnel which had been under construction for about two years previous.

The Standard tunnel is in Gold run, west of Beacon hill, and lies at an elevation of 9027 ft. Its objective point was simply the volcanic plug of Beacon hill. When this tunnel struck the shattered phonolite zone a flow of from 16,000 to 18,000 gal. per min. was maintained for a long time. The ultimate length of this tunnel was 2800 ft., and it was of great value in lowering the permanent water level of Cripple Creek mines.

Still lower is the Newell tunnel which enters Grouse hill at 8930 ft., but it never reached the Beacon hill phonolite, and its face, although 119 ft. lower than the Standard tunnel, never yielded such a large amount of water. The El Paso tunnel was, until the present Roosevelt project began, the lowest and most important drainage tunnel of the entire district. Its portal was at an elevation of 8783 ft., and its effect upon the water level of Beacon hill and adjacent mines was immediate.



METHOD OF DRILLING AND ORDER OF BLASTING. ROOSEVELT TUNNEL

Countryman and Jaquith estimated the total flow of this tunnel up to Jan. 1, 1905, at about 3,550,000,000 gal. of water. It is still discharging a large amount of water, showing that the overlying-rock water is not yet exhausted. The accompanying water-level table is from Lindgren and Ransome's report (*Professional Paper* 54, U. S. Geol. Surv.), with the addition of the position of the Roosevelt tunnel, not included in this report.

Work was begun on this tunnel May 11, 1907, when Lieutenant-Governor Harper pressed the electric button which started the machinery for drilling. The amount subscribed was $760,000. Shortly after the work commenced the contract was thrown up, but was reassigned to A. E. Carlton at $28 per ft. The entrance of the tunnel is in Gatch park, below Cripple Creek, near a place known as "Window Rock."

Separation of Arsenic and Antimony by Means of Knorr Distillation Apparatus

By Walter C. Smith*

After having worked for several years under A. E. Knorr, formerly research chemist for the United States Metals Refining Company, and at present consulting chemist to the United States Smelting, Refining and Mining Company, and having had occasion to make many rapid and accurate determinations of arsenic and antimony, I take pleasure in describing the method devised and used by Mr. Knorr.

Apparatus

The apparatus consists of a dropping funnel *A*, a set of two or more flasks *D* and a condenser *G*. Mr. Knorr's arrangement is shown in the accompanying sketch. The funnel, flask, condenser and burner are mounted on an adjustable sleeve *K* sliding and turning freely on stand rod *J*. This arrangement permits of very rapid and easy change of beakers or receivers *I*. Under *D* is an asbestos shield *Q*.

The method is based upon the fact that there is a considerable difference between the temperatures at which arsenic and antimony will distil from chloride solution, or in presence of HCl. The arsenic and antimony must be present as the arsenious and antimonious compounds.

Procedure

Weigh up sample of material, transfer to flask *D*, add about 1 c.c. H_2O and 10 to 12 c.c. concentrated H_2SO_4, boil until sample has entirely decomposed. If sample is not readily decomposed by H_2SO_4, several additions of a few drops of HNO_3, or a little $NaNO_2$ often assist; organic

*Chemist, Grasselli, Ind.

matter can be destroyed in this manner. When HNO_3 or $NaNO_3$ has been used, or when sample contains oxygen, the arsenic and antimony are best reduced by the addition of about 5 c.c. of hypophosphorous acid and boiling, after fumes of H_2SO_4 appear, until the sulphur balls have disappeared, allowing to cool and adding 15 c.c. of H_2O.

When working on lead or copper bullions, refined metals, bismuth, etc., carrying low percentages of arsenic and antimony, one of the standard methods of removing excess of copper, lead, or bismuth, respectively, should first be used, and the arsenic or antimony in form of sulphides, or mixed with $Fe(OH)_3$ should be transferred to flask. In many cases a fusion with Na_2CO_3 and sulphur will often "break" a sample more rapidly than boiling with H_2SO_4. Separate heavy metals, as sulphides, and transfer together with paper to flask; add H_2SO_4, HNO_3, destroy paper, add hypophosphorous acid and boil until sulphur is all expelled; cool and add 15 c.c. of H_2O.

After the above preliminary treatment of the sample turn on water in cooling bath *H* and connect up apparatus as per sketch, moistening ground joints *C* and *F* with a drop of concentrated H_2SO_4, to prevent sticking when cold. Fill dropping funnel *A* with concentrated HCl. In warm weather or when acid in funnel *A* becomes too warm and causes gas to be liberated at stop cock *B*, add a very small amount of water to the acid in the funnel.

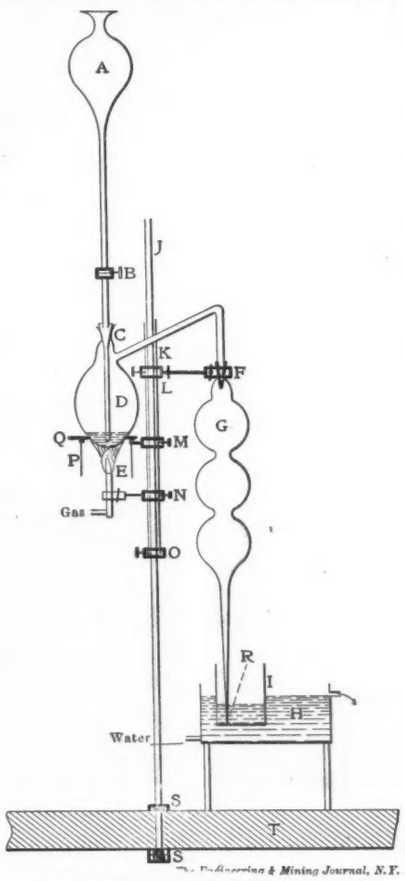
There are two methods for the arsenic separation: First, direct separation, for raipd work, and when sample is low in arsenic or antimony; not good for accurate work on compounds high in arsenic or antimony; always danger of contaminating arsenic with antimony. Second, double separation, for high arsenic and antimony compounds, and for very accurate work.

Direct Separation Method

Place 250-c.c. beaker containing 30 to 35 c.c. of H_2O under condenser in cooling bath *H*, so that end of condenser *R* just about reaches bottom of beaker. Light burner, and keep contents of flask agitated until boiling freely. This can be done by giving rod *J* a rotary motion.

When boiling freely and air is all expelled (steam will cause a sharp snapping sound in beaker *I*), open stop cock *B* and allow about 30 c.c. of HCl to run into the flask as rapidly as possible, without cooling enough to stop boiling. Regulate acid feed to two or three drops per second and allow apparatus to run in this manner for 10 to 15 min. Prepare new beaker with 30 to 35 c.c. of H_2O, then with left hand raise sleeve *K* and with right hand exchange beakers, returning them to original position. Beaker No. 1 should contain all the arsenic. Allow to run 5 min., change beaker and test for arsenic with H_2S. Continue with 5-min. tests as long as yellow As_2S_3 shows.

When arsenic is all over, cut down acid supply to one drop every 1 to 1½ sec. and run down until very faint white fumes of H_2SO_4 begin to show in flask and condenser. Increase acid two to three drops per sec., and regulate burner so that fumes of H_2SO_4 are barely visible. This is the indication of proper temperature for the distillation of $SbCl_3$. Dense white fumes of H_2SO_4 always mean that antimony will be contaminated with bismuth and copper if present. Run through from 1½ to 2 funnelfuls of HCl before making test. Change beaker *I*, run 10 to 15 min., change beaker, neutralize tests with NH_4OH,



THE KNORR DISTILLATION APPARATUS

acidify with HCl and test with H_2S. Continue until test shows no antimony.

The arsenic and antimony can be determined by titration, or precipitated as sulphides, washed with alcohol, carbon bisulphide and ether, dried and weighed. If any selenium is present it will appear with arsenic distillate causing a brick-red color. Precipitate selenium with SO_2, filter off and expel SO_2 by boiling on water bath.

Procedure for Double Separation

Instead of beaker *I*, as in direct method, use flask similar to *D*. Do not run in 30 c.c. HCl, but start off as soon as air is expelled by using two to three drops per second and bring to faint fumes. All the arsenic and the greater part of the antimony will be caught in two-thirds to three-fourths of flask full of distillate. Exchange beaker for flask, continue until 1½ to 2 funnels full of acid have been used and make tests as in direct method.

The flask containing arsenic and antimony is then connected to funnel and condenser and boiled down to 20 to 25 c.c., catching distillate in beaker. Start dropping in HCl, two to three drops per sec. for 5 to 10 min. All the arsenic will then be in beaker and antimony in flask. Add tartaric acid to latter and rinse into beaker. Combine with balance of antimony distillates and determine as in direct method.

The original still residue can be carried down to fumes of H_2SO_4, thereby expelling HCl and Cl. Then the Cu, Bi, Te, Fe, Ni, Co, Zn, etc., can be readily determined, with far greater accuracy than by using the sulphide separation for arsenic and antimony.

Application of Method

I have used this method on a variety of substances, some of which are copper bullion, refined copper, copper-furnace slags, ores, mattes, electrolytic-copper slimes, lead bullion, refined lead, lead-furnace slags, ores, leady mattes, hard lead, bismuth (crude and refined), flue dusts and alloys. The method is not satisfactory when tin is present. It is not an easy distillation to handle and requires constant attention, but after a few trials will give very satisfactory results.

The glass parts of this apparatus are made for Mr. Knorr by E. Machlett & Sons, 145 East Twenty-third street, New York City. They come in sets of one condenser, one funnel and six flasks, marked and ground to fit.

Avino Mines, Limited

In the first quarterly report of the Avino Mines, Ltd., operating in Gabriel, Durango, Mexico, the tonnage of shipping ore mined and sorted from April 28 to Sept. 21, 1909, is given at 2834 metric tons. Of this amount 2397 tons were shipped to smelteries, returning an average of 16.49 pesos per ton. The mine working costs are about 11.84 pesos. The sorting ratio is 2½ to 1.

Development work consisted of 163 ft., on levels Nos. 4, 6 and 6½. Experiments by H. E. Wood, Denver, led to the purchase of one of his machines for testing purposes at the mine. These tests will be on a scale of 30 to 40 tons per day and, should they prove satisfactory, a plant will be installed to handle 100 tons per day. The tests made were upon two lots and yielded results as follows: 30 mesh; gold recovery, 49.04 per cent.; silver, 69.56; copper, 78.76. 60 mesh; gold recovery, 56.68 per cent.; silver, 80.71, copper, 84.39. The tailings from the Wood apparatus are to be sized and fed to Wilfley and Deister tables.

Notes on the Rainy River District, Ontario

A Canadian Gold Camp where Rich Seams and Pockets Occur in Connection with Milling Ore of Low Grade; Mines Well Equipped

BY W. L. FLEMING

This is the only gold camp of present importance in Western Ontario. It was discovered about 15 years ago and has been fairly active ever since, although at no time has there been anything that might be called a boom in the camp. Its history has been one of stock manipulation and uncertain mining methods, but the tendency now is to legitimately exploit the large bodies of low-grade ore that are here and to do away with the effort to make a showing from the rich pockets with a small mill.

Many failures are visible in the district, mines with an expensive and complete equipment lying idle while the buildings rot and the machinery rusts and becomes worthless. Some of these properties are believed to be good ones by the best mining men of the district, if they were properly handled. But under the methods by which they were operated, the mines never had a chance to show their value. It is the old story of mismanagement founded upon the idea that ore, once discovered, immediately justifies the erection of a plant whose capacity is limited only by the resources of the stockholders. A promising prospect is found and a streak of rich ore discovered in it. To sell the stock a mill and accompanying equipment of buildings, tramway, hoist, shops, etc., are built. Then, to operate the plant, as the prospectus so glibly promises, ore must be mined and hoisted as best it may without regard to systematic, or, indeed, any development. The result is that the rich pocket is worked out, the mine is not in shape to handle at a profit the lower grade of ore that is left, and the stockholders, once misled, are unwilling to advance further funds with a possibility of a repetition of the previous experience.

However, the properties that are working now are upon a different basis. They are in charge of capable superintendents and an effort is being made to develop the ore first and plan for its treatment afterward. No one looks to the high-grade ore for a working supply; it is held as incidental to the bodies of low-grade material. The future of the camp as a low-grade one is promising and the successful outcome of the work that is now being done should stimulate a resumption of work on the abandoned mines in the effort to open up the once despised low-grade ores.

Transportation

Western Ontario is generally a flat or gently rolling country, full of lakes and swamps, and heavily covered with brush and medium sized trees. The undergrowth is so dense that the South African term, "bush," is applied to the forests. Traveling and freighting, away from the railroad, is done in summer by canoes and small steamers or launches; any journey being readily made by canoe over the lakes and across the intervening portages. All freighting possible is left to be done during the winter months when the mercury often stands at 50 deg. F., below zero and sleds can be driven on the ice over the lake routes. All kinds of game and fish abound.

The town of Gold Rock is situated on a bay of Manitou lake and is reached by steamer from Wabigoon to Budloe's landing, 18 miles, and by team from that point, 6 miles. Wabigoon is a station of the Canadian Pacific Railway, about 200 miles west of Ft. William. The topography of the Rainy River district is somewhat rougher than the usual surface of Western Ontario, the hills rising to a hight of 150 ft. above the level of the lakes. All the mines are worked through shafts, either vertical or slightly inclined.

Fuel and Labor

Steam power is used at the mines. Cord wood is supplied at $1.25 per cord. The Laurentian mine is figuring on a water power from further up Manitou lake, but the distance is great and the cost of installation heavy. The pumping problem is not as troublesome as might be expected in such a locality. The Laurentian mine, with a depth of about 400 ft., handles 75 per cent. of its water from the 100-ft. level; the Paymaster, with 300 ft. of depth, yields only 7000 gal. per 24 hours. The mill water is all pumped from the lakes, the piping being buried 4 ft. underground on account of the severe frosts of winter.

PAYMASTER MINE, RAINY RIVER DISTRICT, ONT.

LAURENTIAN MINE AND MILL

There is no union among the miners, the wage scale being as follows, per 10-hr. shift: Machine men, $3.25; helpers, $2.90; muckers, $2.75; surface laborers, $2.50; engineers, $4; firemen, $2.75; amalgamators, $4; night millmen, $3.50; board and lodging, $5 per week. The only method of milling in the district up to the present time has been by stamp mills with inside and outside amalgamation.

A feature of the district that appeals to the visitor is the universal neatness and orderly appearance of the camps. The workmanlike aspect of the mine buildings and equipment, together with the fact that

the work is in the hands of capable men augurs well for the future of a district that is still in the development stage.

Occurrence of Ore

The country rock of the district is a wide belt of a green diorite with a northeast and southwest trend. This diorite is highly silicious, so much so, in fact, that it is in many places nearly a quartzite. Masses of quartz occur in the diorite having a schistose structure. These masses are irregular in size, shape and extent, and from them small stringers of quartz run in all directions, some of which are quickly lost, and some pursue an irregular course to another quartz mass, branching and coming together again as they go, thus making a network of small quartz streaks through the country rock.

The workable ores occur in shear zones which have a northeast-southwest strike corresponding to the trend of the diorite. They are fairly regular in width and have a dip not far from the perpendicular. In these zones silicification has taken place strongly so that the white quartz and shattered fragments of diorite are intimately mixed. The gold occurs both free and in combination with pyrites in both quartz and diorite in these zones, the pyrites being of a low grade but abundant. Traces of platinum are found in all the ores.

The quartz is rich in places, some beautiful specimens having been found and visible free gold on fragments of rock not being uncommon. However, these rich ores are limited in extent and pockety. The future of the camp depends upon the exploitation and working on a large scale of the low-grade ores which form the content of the shear zones. It was the effort to work the mines for these high-grade streaks which brought disaster to many operations of the camp.

The shear zones are from 5 to 25 ft. in width. The rock is hard to a degree and "fitchery." All underground work is done by 3¼-in. machine drills. The ore is stoped by the shrinkage system, neither timbering nor waste filling being done. Shaft sinking is frequently done by contract; one such shaft was sunk more than 300 ft. without the use of a stick of timber, the miners contenting themselves with barring down any loose pieces of rock that might be seen as they went down in the bucket at the beginning of each shift.

Minnehaha Mine

The Minnehaha Mining and Smelting Company owns 2 claims, 67 acres, on the northeast shore of Minnehaha lake, between Minnehaha and Whitewater lakes. The steamer from Wabigoon touches at a dock on this property. The mine has been idle during the past year on account of litigation, but work is now being recommenced under Frank C. Dimmick. Geo. P. Good, of Detroit, is the consulting engineer.

There are several shallow shafts and surface cuts on the property, one such cut exposing a shear zone of considerable width. The main shaft is 112 ft. deep and is full of water, but it is claimed that a crosscut at the bottom has penetrated 12 ft. of vein matter. The work planned includes a drift tunnel from lake level to this shaft, the erection of shops, and the installation of a 2-drill compressor and machine drills. Supplies are now being laid in and preparations made for active work during the winter months. The company also contemplates the erection of a test mill after the design of Mr. Good. The mill is to contain a National ore pulverizer and a Pierce gold separator and amalgamator.

Volcanic Camp and Little Master

The Volcanic Camp comprises 1150 acres on Mud, Summit and Peak lakes. It is under option to Detroit people for the sum of $20,000 and representatives of the company are expected soon to decide upon the work to be done.

The shaft on the property is 318 ft. deep and about 150 ft. of drifting has been done. There are about 5000 tons of ore on the dump, all of which is said to be of milling grade, and, should the option be taken up, a mill will be installed to treat this ore. The mine is equipped with a geared hoist, boilers, 3-drill compressor and a diamond drill.

The Little Master is a fully equipped property just west of the Volcanic camp. All its work was done on the so-called Black vein which strikes through the ground of several companies and which has never yielded any encouragement upon prospecting.

Detola Development Company

This company, operating the Detola mine, owns 78 acres on the north shore of Mud lake. The shaft is 175 ft. deep, 250 ft. of drifting have been done at the 105- and 150-ft. levels and a station has been cut at 175 ft. Several veins have been opened by surface cuts but all the work has been done upon the one vein. Notwithstanding the fact that until now no effort has been made to mill or ship ore, the buildings and equipment on this property would do justice to a producing mine. Not that they are unduly elaborate, but are well designed, well built and well cared for. The equipment includes a 5-drill compressor, two 3¼-in. drills and a geared hoist.

Superintendent Dryden Smith is working a crew of 23 men, in 2 shifts, on development work, and expects to keep this number through the winter. The management is not satisfied that simple amalgamation with stamp mills is the best treatment for this ore, and experiments are being made to determine the process most suitable. The water is handled by two Knowles sinking pumps and a Hooker station pump.

The Paymaster Mine

The Paymaster mine has been working steadily on development for the last five years. It is owned by the Northern Development Company, Detroit, and is in charge of George Thow, a mining man with wide experience in California. This property is in first-class condition and its future is bright. It has 320 ft. of shaft and 1800 ft. of tunnels at the second and third levels. Although there are five veins on the property, all this work has been done on one vein which averages 29 ft. in width at the 300-ft. level. A still larger vein lies to the south, but it has not yet been prospected. A crosscut has been started to tap this vein and has been driven 200 ft. from the shaft.

The company is now erecting a 10-stamp mill equipped with 1000-lb. stamps and three Frue vanners. The concentrates are to be shipped to a smeltery. The stamps are expected to commence dropping Dec. 1. Mr. Thow states that this mill is being erected more with the idea of testing the ores than in the hope that it will prove profitable, and that himself and his company will be well satisfied if it pays the operating expenses. The mine is being developed with the expectation that it will justify equipment for operating on a large scale.

Sufficient ore has been opened up to operate 10 stamps for many years, and a two-years' supply is blocked out on at least three sides. The crew at present consists of 22 men, of whom 16 are on construction and 6 in the mine. This force is to be retained for working after the mill is completed. The property is equipped with a sawmill, shops, hoist and one side of a 10-drill Ingersoll compressor. The mine produces 7000 gal. of water per 24 hours, handled by a 6x4x6-in. Snow pump. A Northey pump, made by the Canada Foundry, of Toronto, is to be installed.

The Laurentian Mine

The Laurentian, owned by the Imperial Gold Mining Company, Ltd., is the largest in the district, and has been a producer for several years. No figures of its production are obtainable, but the capacity of the mill is 60 tons per 24 hours and the average extraction is not far from $5. R. B. Nickerson, the superintendent, also a California man, believes the Laurentian to be the equal of many mines on the Mother Lode, but does not believe in the advisability of continued working on the present scale. It is rumored that there is to be a change in the management of this property in the near future, and, in this event, it is hoped that the policy of working a large mine on a small scale will be abandoned. The equipment for the present capacity is complete and well kept up, even to a small farm which supplies some of the vegetables and hay used at the mine. The buildings are set in a line along a street; everything is kept in good condi-

tion, and a general air of competent superintendence prevails. The arrangement of the mine buildings is unique in that the mill is built on the hillside *above* the shaft house.

The ore is hoisted in a one-ton skip which dumps into a chute leading to a waiting two-ton skip on a track beside the shaft house. The geared hoist has a double drum, one drum of which operates the mine skip, and the other hoists the two-ton skip to the mill bin. From this bin the ore all goes to the rock breaker without passing over any screen or grizzly. The rock breaker discharges into a bucket elevator which empties into the mill bins.

The mill contains twenty 1000-lb. stamps, using hammered-steel shoes and dies. Hight of drop, 6 in.; rate of drop, 100 per min.; screens, round-punched with 100 1-mm. holes per linear inch; daily capacity, 60 tons. Back plates and chuck blocks are used inside the mortars, and splash, lip and apron plates on the outside. Below the plates a part of the stream of tailings is deflected to a Wilfley table used for sampling the concentrates. The tailings are heavy with pyrite and are said to contain $2 to $3 per ton in gold. The sulphurets are too low-grade to separate and ship to a smeltery, but the tailings are stored by dam and held for possible future treatment.

The compressor in use is rated at six drills, being one-half of a 12-drill machine. The drills used are 3¼-in., and in the stopes an average of six to eight 9-ft. holes are drilled per 10-hour shift, four machines breaking about 100 tons per shift. High-grade ore has been taken from this mine in such quantities that a change room has been built, the miners being required to strip and pass under the watchman's eye. A crew of 25 to 30 men is employed. The shaft is 400 ft. in depth, and a winze has been sunk 80 ft. below this level. This winze is now in good ore.

The Big Master mine deserves at least passing mention on account of its large and costly equipment, now lying to rot and rust except for such movable objects as may be of use to some prospector . The equipment was put on too soon and the mine sacrificed to its "improvements."

Test of Monorail Car

A full-size car on the gyroscope-monorail plan was tested in London, Nov. 10. The car was 40 ft. long, 10 ft. wide and 13 ft. high, weighed 22 tons, and carried 40 passengers. Full speed could not be reached on account of limited trackage, but the test was otherwise perfectly satisfactory. A speed of 25 miles per hour was attained and no tendency of the car to leave the rail was evidenced.

The inventor of the monorail car and system of transportation is Louis Brennan, also inventor of the Brennan torpedo. The car is mounted on four wheels set in line along a single track. The center of gravity is above the points of suspension; the balancing of the load depending upon two gyroscopes weighing about 1500 lb. each and running at a speed of 3000 r.p.m. This has been found more than sufficient to balance the car used at the test. A noticeable feature of the test was that a crowding of all the passengers at one side of the car caused a lifting of that side rather than a depression.

This system of transportation, it is claimed, will be widely adopted as it permits of high speed with perfect safety, construction costs of road are small, heavy grades and sharp curves are negotiated easily, and bridge construction is reduced to the simple matter of suspending a cable.

Use of Titanium in Making Steel Rails*

The use of titanium in making bessemer steel for rails has been fairly started on a commercial scale. Rails made in this way have received a test on the New York Central, and this year a number of trial orders have been given by both eastern and western lines. The method consists in the use of ferrotitanium, made in the electric furnace; this is an alloy of iron and titanium which combines readily with steel and by the reaction purifies and improves its physical properties. The process employed in this manufacture by the Titanium Alloy Manufacturing Company is covered by patents granted to Auguste J. Rossi, who has made a special study of the subject during the last 30 years.

Titanium has great affinity for nitrogen, and it is now believed that the amount of nitrogen retained in steel is large and thus has an important effect upon the physical properties of the metal. It is natural, therefore, that ferro titanium should be employed as a flux for cleaning iron and steel at the moment of casting or pouring from the converter, as ferro silicon and ferro manganese are employed. Sulphur and phosphorus do not appear to be reduced, but in combining with oxygen and nitrogen forming oxides and nitrides, titanium has an important action in removing impurities, forming with them a stable combination, which passes into the flux.

Thus the principal function of titanium alloy is to act as flux, and the cleansing effect results in increased solidity and purity, which have such an important influence on the mechanical structure of the steel, preventing breaking down under heavy rolling loads and reducing the wear due to abrasion which are the serious defects of ordinary bessemer rails.

Ferrotitanium contains 10 to 15 per cent. of titanium, 5 to 7 per cent. of carbon, and of other impurities less than 5 per cent.; the balance is pure iron which has been electrically refined. In bessemer-steel manufacture it is the practice to add about 1 per cent. crushed ferro titanium in the ladle as the steel is poured from the converter.

The equivalent weight of titanium is 0.1 per cent. of the weight of the molten steel poured into the ingot mold, and the additional cost is now about $3.50 per gross ton of rails. It is claimed that this small proportion of ferrotitanium is sufficient to remove the bulk of blowholes and segregation usually found in bessemer ingots and produce clean, solid, good-wearing rail.

The first experiments with titanium alloy in rail manufacture were made by the Maryland Steel Company in November, 1907, and this was followed in 1908 by the Duquesne Works of the Carnegie Steel Company, the Cambria Steel Company and the Lackawanna Steel Company. During the last year the process has been used in a large number of rails.

The results of six months' service on a New York Central cross-over carrying a heavy tonnage show that the flange wear of titanium rails is only one-fourth that of ordinary Bessemer rails, and it is claimed that the average service in main line will be as three to one in favor of the titanium rail.

*Abstract of article in *Railroad Age Gazette*, Nov. 12.

Operations of the United States Steel Corporation in the Birmingham District

SPECIAL CORRESPONDENCE

At the present date nearly all of the plants and ore mines of the Tennessee Coal, Iron and Railroad Company, in the Birmingham district are in operation. At Ensley the No. 1 furnace is being run on foundry iron, and the No. 2 is being rebuilt and enlarged; Nos. 3, 4, 5 and 6 are in blast. The openhearth plant and steel mill are in operation. The Alice furnace at Birmingham and the Nos. 1, 2, 4 and 5 furnaces at Bessemer are in blast.

The company is mining hard red ore from 14 slopes on Red mountain and besides supplying the furnace, immense stock heaps of ore are being accumulated at each of the three divisions on the mountain. In the Greeley district about 17 miles southwest of Bessemer, three brown-ore properties are being worked. This district is supplying the greater portion of the soft ore used by the Steel Corporation furnaces in the Birmingham district. At Champion, 37 miles north of Birmingham, the company is also operating a soft-ore property and has one washer with a daily capacity of from 300 to 600 tons in operation. Flux is being quarried at Ketona, 6 miles northeast of Birmingham, where two dolomite quarries are worked. Limestone is being quarried near Trussville, Alabama.

Power Plant Economics as Applying to Mining

By Hartwell Jalowick*

The conditions surrounding the development of steam for general mine use, whether for engines, auxiliaries or for pumping, demand that exceedingly low-efficiency apparatus be utilized. This poor economy, however, is not due to any lack of engineering ability on the part of manufacturer or designing engineers, but is merely due to the inherent characteristics of the class of machines as a whole. It is entirely unavoidable in any but large tandem or triple expansion installations. In corroboration of this I submit the following figures:

It is conservative to estimate that in mine installations over 95 per cent. of the steam used is consumed in the hoisting and pumping equipments, and it is a fact that this apparatus, particularly the pumps of the common type, is among the most uneconomical on the market. Next to the pump, in line with poor economy, comes the hoisting engine. To afford some tangible idea of the steam consumption of the different classes of equipment it is to be noted that the simple high-speed engine consumes between 32 and 43 lb. of steam per h.p.-hour, an automatic high-speed engine requires from 25 to 35 lb. and a compound Corliss from 22 to 30 lb. With pumping equipment in good to fair condition the steam consumption for the simple pump averages between 125 and 275 lb. per h.p.-hour, and the compound pump requires from 75 to 100 lb. and in rare instances may go as low as 65 lb. per h.p.-hour.

Assuming it requires 2545 heat units (B.t.u.) to produce one pump, engine, or other mechanical horsepower, and further that it requires approximately 966 heat units to produce 1 lb. of steam from and at 212 deg. F., it is calculated that the percentage of total to available energy utilized in the production of useful work, as applied to the separate cases noted above, becomes for the simple engine only a trifle over 7 per cent. for the automatic high-speed 8.80 per cent. and for the Corliss engine only 10.15 per cent.; in the case of the pumping apparatus these already low figures dwindle to approximately 1.32 per cent. for the simple pump and only 3.20 per cent. for the compound pump. Expressing the above results in terms of wasted energy it becomes apparent that from 93 to 89⅞ per cent. of the available energy is wasted by the reciprocating engine equipments, and that from 98⅔ to 96⅘ per cent. represents the wasted energy for the pumping equipments.

From the above it may be expected that practically all steam-using apparatus will remain either extravagant or economical in the use of steam depending primarily upon the badness or the goodness of the original design. In other words, beyond the already economic design of the apparatus in question it becomes exceedingly difficult—to say nothing of being expensive—to better the originally designed economy of any particular steam-using unit; the best that can be expected is to keep the apparatus up and to maintain its already designated point of efficiency.

Remedy Lies in the Boiler House

It is quite evident, in view of the foregoing, that the general question involved in the important factor concerning power economy in the major degree lies beyond the motive power equipment, for, as has been pointed out, under the best of conditions the inherent economy as well as the thermal efficiency is exceedingly low, hence I will turn to the boiler plant equipment. In great contrast to the motive power equipment, it will be noted that here the question of "personal equation" becomes one of prime importance, in illustration of which the following data will be interest:

In the analysis of boiler equipments we find that 80 per cent. represents the efficiency which is often approximated but rarely ever quite reached in practice. This efficiency, attained by the use use of good anthracite coal, represents an equivalent evaporation from and at 212 deg. F. of approximately 12 lb. of water per pound of coal, and, accepting the common ratio of 445 lb. of coal being equivalent to 1000 lb. of wood, gives an equivalent evaporation of 5.34 lb. of water per pound of wood. Now, from data covering 16 installations over a wide range of territory, as reported by George H. Barrus, a recognized authority on boiler and engine tests, the average evaporation per pound of fuel was only 9.447, which, on the basis as outlined above, would indicate a boiler efficiency of approximately 63 per cent. These results, however, represent the common practice in the Eastern States where good fuel and more or less intelligent labor are both obtainable.

Data covering eight mining installations and three public utilities properties, all using wood or lignite as fuel, indicate the average boiler efficiency to be between 53.10 and 45.35 per cent., giving an average of a trifle over 49 per cent. It may, therefore, be safe and conservative to assume that a boiler efficiency of 50 per cent. is commonly attained in the industrial and mining installations of the Southwestern States and Old Mexico, where low-grade fuel is, with rare exceptions, the only one obtainable, and where unskilled labor is by necessity used. At this efficiency (50 per cent.) the equivalent evaporation becomes 7.5 lb. of water per pound of coal, or 3.33 lb. of water per pound of wood.

Great Saving May Be Effected

From these results it would seem that a boiler efficiency of 70 per cent. would be comparatively easy of attainment, were the importance of the matter given more earnest consideration by the operators of such properties, and by this increase in efficiency the saving realized in fuel expense alone, with a given set of conditions would amount to about 28½ per cent.,

SAVING PER 100 H.P. PER YEAR FOR BOILER EFFICIENCY ABOVE 50 PER CENT.

Boiler efficiency.....	70%	66%	62%	58%	54%
Simple pump	$19,500	16,500	$13,200	$9400	$5000
Compound pump.....	8,000	6,800	5,550	3850	2050

which, at a fuel cost of $8.75 per ton for coal, or an equivalent of $3.50 per ton for wood—assuming an output of 100 h.p. per

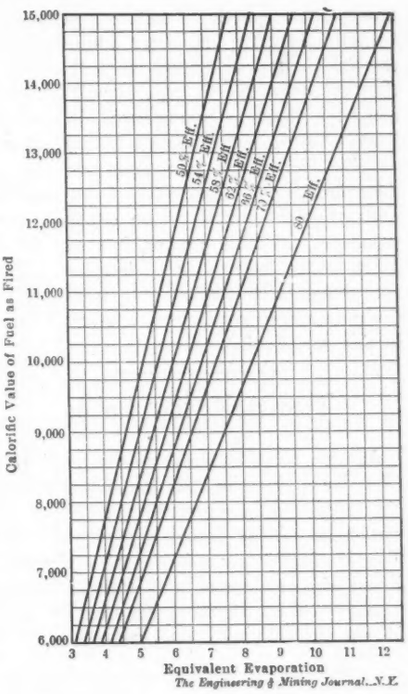


CHART SHOWING BOILER EFFICIENCIES

20-hour day, 300 days per year—gives the accompanying tabulated results:

In these calculations it is to be noted that no item of economy other than that actually realized in fuel saving has been included; it is, however, reasonable to suppose that high efficiency goes hand in hand with low maintenance and decreased depreciation, and further, that relatively decreasing labor costs will result. I also call attention to the fact that calorific value, i.e., fuel value, and equivalent evaporation bear a definite relation to boiler efficiency for each grade of fuel; it must be borne in mind, therefore, that this writing merely treats upon the subject, considering the advantages and the monetary gain to be realized by the application of economic engineering to any given fuel, the same equipment and similar duty. An accompanying chart shows the relation between calorific value, equivalent evaporation from and at 212 deg. F. per pound

*Consulting mechanical and electrical engineer, 7 Pioneer Plaza, El Paso, Texas.

of fuel, and boiler efficiency, the calculations having been made to correspond to the values of the table.

There is no one boiler or other equipment which is better than every other for every set of conditions, nor is there any one economic method which is better than every other for every set of conditions, yet considerable time and money are every day spent in the selection of boilers and engines, and at the same time, but little attention is paid to the economics of these equipments after their installation, even though the setting, the firing and the running of these equipments represent the three main factors of pure power economy and long life.

People in general are inclined to be a trifle slow in grasping possibilities which do not involve matters of great magnitude; however, the smaller details are gradually being given more and more attention and the time is not far distant when this question of economics in general will become a matter of prime importance. When, as I have illustrated, a saving in fuel alone varying from $2050 to $19,000 per year—depending upon conditions—is attainable with practically little or no expense, one wonders why this matter has not been given more general consideration. Yet the above brief outline only treats upon the possibilities relating to one small item in this vast field.

Transvaal Mine Labor

At the recent annual meeting of the Glen Deep Company, R. W. Schumacher, chairman of the company, submitted a statement of the labor employed in the Transvaal gold mines for a series of years. From this statement the following figures are taken, showing the number employed at half-yearly intervals:

	Whites.	Negroes.	Chinese.	Total Colored.
1902, July	7,993	31,650	.....	31,650
1903, Jan.	10,783	48,058	.....	48,058
1903, July	11,873	68,217	.....	68,217
1904, Jan.	12,814	75,027	.....	75,027
1904, July	13,707	73,370	1,388	74,758
1905, Jan.	15,536	89,895	27,222	117,117
1905, July	17,170	103,623	43,191	146,814
1906, Jan.	15,582	93,933	47,166	141,099
1906, July	17,757	90,420	52,231	142,651
1907, Jan.	17,874	102,477	53,856	156,333
1907, July	17,307	110,822	51,472	162,294
1908, Jan.	17,522	133,515	33,849	167,364
908, July	18,342	149,453	19,071	168,524
1909, Jan.	19,801	169,537	11,534	181,071
1909, July	22,021	171,100	5,360	176,460

Mr. Schumacher comments on this statement as follows: "It will be seen, for instance, that in January, 1903, or six months after the war, there were little over 48,000 natives at work on the gold mines throughout the Transvaal. In January, 1904, just before it was decided by the Transvaal Legislature to import Chinese, the number had risen to 75,027. The position, you will remember, had then become critical. Many more natives were wanted, but they could not be obtained, and all expert evidence of the time tended to show that the existing supplies could not be augmented appreciably. Even in January, 1906, the position was very little better, for the number of natives employed was only 93,933, in spite of all efforts to recruit more. However, after January, 1907, when there were 102,477 natives at work, the numbers began to improve steadily, and the wastage caused by the gradual repatriation of the Chinese, which commenced in June of that year, was more than compensated by the influx of South African natives. It is interesting to note that the highwater mark reached in April, 1909, of 181,389 natives employed on the gold mines in the Transvaal was higher than any record up to the end of 1908 of both natives and Chinese combined, even including the period May, 1906, to August, 1907, when there were more than 50,000 Chinese here. These figures give an idea of the enormous improvement which has taken place in recruiting native labor for the gold mines since the periods of extreme shortage which already made themselves felt soon after the termination of the late war. It is true that a number of causes can be assigned for this improvement, such as the fact that bad times existed all over South Africa, which adversely affected all industries except gold mining, and put a complete stoppage to nearly all government and public works throughout South Africa, thereby releasing a large number of natives for work on the mines. It is also a fact that a number of recruiting fields, such as Natal, that are now open to us, were closed not long ago.

"But over and above these causes and others which undoubtedly exist, no impartial man can overlook the fact that since General Botha's gevernment came into power in this colony it has done its utmost to assist the mines in their recruitment of labor. It would be ungenerous not to acknowledge this to the full, and not to admit that the Transvaal government has so far proved correct in its assurance that natives would be found to replace the Chinese which they decided to repatriate."

Mineral Production of the Philippines

The mineral production of the Philippines, as collected and reported by the Division of Mines of the Bureau of Science at Manila, has been as follows for two years past. Gold and silver are given in troy ounces, the rest in metric measures:

	1907.	1909.	Changes.
Gold, oz.	4,540	10,510	I. 5,970
Silver, oz.	83	2,350	I. 2,267
Copper, Kg.	.....	91	I. 91
Iron, tons	396	97	D. 299
Coal, tons	4,123	10,035	I. 5,912

The silver is recovered in connection with the gold. In addition to the quantities given, small amounts of gold and copper are mined by the Igorotes, the quantities being impossible to ascertain.

The value of the structural materials reported was, in pesos: Building stone, 149,930; gravel, 171,360; sand, 35,000; lime, 20,000; clay products, 421,628; making 797,918 pesos—or $398,959—in all.

Texas May Stop Convict Mining

A despatch states that the penitentiary committee has recommended the immediate cancellation of the contract which the State of Texas has for working convicts in coal mines at Calvert, Tex., the following resolutions having been adopted:

Whereas, a subcommittee of the penitentiary committee, duly appointed by the chairman thereof, visited and inspected the coal mines near Calvert, Tex., in which 100 convicts are worked; and

Whereas, said committee made a thorough personal inspection of the condition existing in and about said mines and from their personal inspection, and from testimony of officers in charge of said camps and convicts working in said mines, they found the following conditions: That practically all the men in going to and from their daily work in the mines are forced to walk through mud and water, thereby wetting their feet, in which condition they are forced to work during the day; that some of the men were required to work in water, mud and slush from shoe mouth to half-leg deep and to do their daily task of mining seven tons of coal, which mud and water appears to affect in various ways the physical condition not only of the feet but of the entire physical person of the men thus subjected.

They found that the convicts upon coming out of the mines at night were not furnished with dry shoes, necessitating their going with wet feet to the mine prison building and remaining in that condition until such time as they could remove their shoes after the supper meal. They found that the clothes worn in the mines during the day and changed at night were usually wet, and that in winter the clothes were frozen and that the convicts put them on in that condition the following morning, in which condition men were forced to pursue their labors. They found several under the age of 21 years, yet lacking the full development of manhood required to do the daily task of seven tons. They found from hospital records, kept under the direction of the camp physician, that their employment in said mines is hazardous and unhealthy and

Whereas, we believe that the State of Texas has no moral or legal right to force men convicted of violation of the law to labor under such conditions; therefore be it

Resolved, that we urge the governor of the State of Texas, the board of penitentiary commissioners and superintendent of penitentiaries to cancel the contract with the Southwestern Fuel and Manufacturing Company.

Some Facts and Figures of Sorting on the Rand

Efficiency Greatly Increased by Double Sizing by Grizzlies; Ferreira Mine Saves $106,000 and the Crown Reef $46,800 per Year

BY L. D. HUNTOON*

The gold mines on the Rand, in South Africa, offer some of the best examples of the gradual development of preliminary hand sorting and what can be accomplished by carefully arranged plants. The annual reports of the mining companies contain detailed cost sheets and ore statements, an investigation of which will show the advantages to be derived. The ore is an auriferous conglomerate occurring as beds intercalated in greater part through a quartzite formation. The waste rock consists generally of quartzite, though in some districts slate occurs in addition. The waste rock, varying in amounts from 10 to 80 per cent., depending upon the thickness of the reef and the amount of barren quartzite intercalated in it, is readily recognized after washing. The quartzite in most of the mines contains too little gold to be of value.

Originally the waste was separated underground and used for filling. In most mines of the Rand this has been superseded by separating on the surface in ore-sorting houses, known as rock houses, only large pieces of barren rock being now left underground. The objections to sorting underground are loss of valuable ore due to the poor light, and loss of rich fines and dust covering the waste rock. It has been found by experience that the gold in the fines recovered from washing the waste rock on the surface will more than meet the extra cost of tramming and hoisting.

Double Sizing Employed

The rock houses are placed near the shaft and are independent of the mill. They contain one or more grizzles, breakers, picking floors, picking tables or belts and ore bins. Only a few years ago they were simple in construction, employing what is known as single-stage sorting. By decreasing the size of opening in the grizzly from 2½ in. to 1 in. it was found that the efficiency of sorting was greatly increased. This necessitated a closer sizing of the oversize and a second grizzly was introduced, making the process what is called two-stage sorting, where the sizes delivered to the sorters are 1 to 3 in. and sizes above 3 inches.

In this method, the ore first passes over a 3-in. grizzly, the oversize from which is washed and sorted. The undersize passes over a 1-in. grizzly and the oversize from this is washed and sorted, the undersize going to the bins. Coarse material consisting of waste rock and ore had formerly to be broken with hammers to liberate the waste; to further increase the efficiency and capacity, rock breakers have been introduced to break the coarse material, and sizing trommels to deliver the various sizes of ore to the sorting tables.

In the newer ore-sorting houses the ore as hoisted from the mines is dumped into bins adjacent to the headframe and having a sufficient capacity to permit of the sorting being done in the day time. From the bins the ore is transported by side-dump trucks to grizzlies set at angles of from 40 to 45 deg. A large number of grizzlies, varying in length from 13 to 15 ft. and about 3 ft. wide, are placed side by side depending upon the tonnage to be handled. At the Ferreira mine, handling 1000 tons of ore per day, the grizzlies are 13 ft. long by 70 ft. wide and placed at an angle of 40 deg. with 1-in. spaces between the bars. The oversize, amounting to 70 per cent., falls upon the sorting floor where it is thoroughly washed before sorting. Sorting floors are extensively used at the large plants. At the Ferreira mine the floor is 11 ft. wide, extends the full width of the grizzly, and is covered with ½-in. steel plate. Near the outer edge is a track for cars to transport the waste to the dump, and beyond this is the ore bin. The advantages claimed for large sorting floors are: the ore is tipped where desired; there is no congestion; no power is required; and every piece of rock and ore must be shoveled, resulting in a careful inspection.

Circular Picking Tables on the Rand

The ore-sorting houses in the western States of this country avoid the necessity of large grizzly surfaces and heavy shoveling by discharging the grizzly oversize into bins which in turn feed the ore to stationary ore-sorting tables about 4 ft. wide and elevated about 3 ft. above the main floor. The ore can be washed as discharged from the bin if desired, and the waste rock and ore separated and rolled or shoveled into cars or bins without the necessity of lifting the material the hight of an ore car. After separating the waste on the sorting floors the remaining ore is broken, sized and delivered into bins which discharge, by shaking feeders, constant streams to picking tables or belts. At the feed end of the tables or belts the ore is again washed to recover the fines adhering to the waste rock and to clean the material for closer sorting. The washings from the sorting floors and tables are settled in ponds and the settlings, usually rich, are sent to the mill with the ore.

TABLE 1. COST OF HAND SORTING.

Year.	1889.	1902.	1903.	1904.	Average.
Per ton milled.	$0.192	$0.176	$0.23	$0.21	$0.21
Per ton sorted.	0.39	0.70	0.72	0.72	0.64

Shaking tables and picking belts are little used on the Rand. The shaking table, which is quite similar to a shaking feeder, has too small an area and the ore is of too great a depth to be efficient. The depreciation on the picking belt and its cost of installation is much greater than that of the circular table, resulting in the almost exclusive use of the latter. The circular table, spoken of so highly in the reports from the Rand, has been improved upon and gradually brought up to its present high state of efficiency by the mines in that district. Its outside diameter is about 25 ft. and the inside diameter about 17 ft., leaving an annular area 4 ft. wide for sorting purposes.

The surface of this sorting area is covered with steel and is slightly inclined toward a launder on the outer edge to re-

TABLE 2. COSTS PER TON MILLED.

Year.	1889.	1902.	1903.	1904.	1908.
General	.....	.....	.....	$0.031	}
Transportation	$0.067	$0.093	$0.094	0.059	} $0.180
Crushing	0.072	0.109	0.094	0.086	}
Elevating	.....	0.083	.....	.....	.....
Stamp milling	0.535	0.820	0.680	0.536	0.400
Retorting	.....	.....	.....	0.014	.....
Conveying and classifying	.....	.....	.....	.....	0.094
Tube milling	.....	.....	.....	.....	0.133
Concentrating	0.207	0.329	0.113	.....	.....
Cyaniding sands	0.580	0.688	} 1.100	0.890	0.480
Cyaniding slimes	0.474	0.539	}		
Total	$1.935	$2.661	$2.081	$1.616	$1.287

*Consulting mining engineer and professor of mining and metallurgy, Hammond Mining and Metallurgical Laboratory, Yale University, New Haven, Conn.

ceive the wash water. The table is revolved by rack and pinion from below, near the outer edge, with a speed of about one revolution in 85 seconds. The ore is fed to the circular area by a shaking feeder, washed, and the waste rock picked out by boys around the outside and inside edges. The ore remaining on the table is discharged into ore bins or breakers by a plough placed just in front of the feeder. In the last few years an improvement has been introduced by subdividing the annular area into an upper and lower ledge. The ore to be sorted is delivered to the lower ledge and the discarded waste is placed on the upper ledge. By this arrangement the waste rock discarded can be inspected by the superintendent before it is finally discharged to the waste car or bin. The ore and waste rock are discharged from the ledges to their respective bins by ploughs.

TABLE 3. RESULTS FROM PRELIMINARY HAND SORTING.

Period Ending	Ore Sent to Rock House, Tons.	Hand Sorted Waste.		Ore Milled, Tons.	Assays in Dollars.			Increased Value.	
		Tons.	%		Ore Mined.	Waste Rock.	Ore Milled.	$	%
September, 1891	42,054	.....	....	42,054	.....	....	.....	.....	.....
March, 1892	24,567	.....	....	24,567	.....	....	.....	.....	.....
March, 1893	57,794	9,017	15.6	48,777	19.38	0.78	22.69	3.31	17.08
March, 1894	70,212	22,999	32.8	47,213	21.10	0.94	30.72	9.62	44.40
December, 1894	66,543	29,759	44.7	36,784	19.33	1.06	33.76	14.43	74.66
December, 1895	99,689	38,435	38.5	61,254	19.42	0.97	30.98	11.56	59.49
December, 1896	178,918	58,156	32.5	120,762	17.26	1.06	25.05	7.79	45.15
December, 1897	186,922	61,596	32.9	125,326	17.35	0.49	25.04	7.69	41.40
December, 1898	219,940	88,227	40.1	131,713	13.47	0.83	21.93	8.46	62.85
December, 1899	141,858	46,690	32.9	95,168	14.76	1.08	21.64	6.88	46.60
War period.									
December, 1902	74,511	15,079	20.2	59,432	12.68	1.34	15.56	2.88	22.71
December, 1903	200,581	48,750	24.3	151,831	11.40	....	15.30	3.90	33.20
December, 1904	286,413	65,606	22.6	220,808	11.10	0.98	14.20	3.10	27.90
December, 1905	309,316	71,816	23.3	237,500	.....	....	.....	.....	.....
December, 1906	308,715	56,090	18.2	252,625	.....	....	.....	.....	.....
December, 1907	306,252	37,649	12.3	268,603	.....	....	.....	.....	.....
December, 1908	337,292	46,522	13.7	290,770	10.90	1.40	12.43	1.53	14.00
Totals	2,911,577	696,390	23.9	2,215,187	.....	....	.....	.....	.....

Experience at the Ferreira Mine

The Ferreira Gold Mining Company, Ltd., has carefully investigated preliminary hand sorting on different sizes and has made changes in its sorting station from time to time until it has one of the most efficient on the Rand. What has been accomplished at this mine, since its inception, is shown in the four tables accompanying this article. These tables have been compiled from several of the late annual reports containing detailed ore statements and cost accounts.

The size of opening in the grizzly has gradually been reduced from 2¼ to 1 in. With a 2¼-in. opening, 25 per cent. of waste was discarded at a cost of 12c. per ton of waste. Reducing the size of opening to 1 in., the waste discarded increased to 35 per cent. and the cost to 37c. This increased cost not only warranted the installation of the 1-in. grizzly, but the manager, Mr. Johns,[1] has stated as a result of a test that if the distance between the grizzly bars was lessened to ¾ in. a further profit of $1200 per month could be made after deducting 62c. per ton as cost of sorting the extra quantity and $125 per month as depreciation.

The cost of hand sorting will vary with the size of the ore and percentage of waste discarded. Table No. 1 shows the average cost for 4 years to be 21c. per ton milled and 64c. per ton of waste sorted. The cost per ton of waste sorted is much less than the cost of milling shown in table No. 2 for the same period. Tube mills have been installed within the last few years, reducing the total cost of milling as is shown for 1908, but not reducing the cost below that of sorting.

The greater the percentage of waste sorted, the greater the capacity of the mine or mill and the greater the value of the ore milled. This is well illustrated in Table No. 3 covering 17 years of operations. During this period 23.9 per cent. of the ore sent to the rock house was discarded as waste thereby increasing the capacity of the mill 31.4 per cent. The value of the ore milled has been increased from 14 to 74.6 per cent., and the value of the waste rock discarded, about $1 per ton, is less than that of the tailings. The assays for 1893 to 1902 were taken from reports issued by the company. The assays of the ore mined and milled for 1903 and succeeding years, when not embodied in the reports, were computed from the tonnages given, the gold declared, and the percentage recovered.

The direct saving due to sorting in 11 years is shown in table No. 4. For the first 9 years the figures showing the total savings were extracted from reports, and for the last two they were computed. Sufficient data were not in my hands for the succeeding years to embody them in the table. The total direct saving after deducting all costs amounts to $1,167,000, equivalent to $106,000 per year or $1.06 per ton milled. The table shows the savings are about equally divided between the difference in the cost of milling and the cost of sorting, and the difference between the loss per ton milled and the assay of the sorted waste. Due to the war the property was closed down in September, 1899, and again resumed operations in April, 1902. The losses per ton milled for 1903 and 1904 were computed by deducting the gold declared per ton from the assay of the ore. The assays of the waste rock were taken from various reports, except those for 1903, which is the numerical average of the assays previous to this date.

Saving at the Crown Reef

At the Crown Reef mine a 25-ft. circular table was placed in operation April 1, 1897. During the first three months of operation the working costs amounted to 51c. and maintenance to 43c., making a total of 94c. per ton sorted. The annual report for the year ended March 31, 1898, after using the table one year, contains the following statistics:

Waste sorted, 36,364 tons, equivalent to 16.4 per cent.; cost of milling, $1.65; cost of sorting, 0.68; saving per ton sorted, 0.97; assay of tailings (sands), 1.32; assay of sorted waste, 1.00; saving per ton sorted, 0.32; total saving per ton sorted, 1.29; total saving for year, $46,800.

From the above reports it would appear that properties operating in the States can well afford to fully investigate the advisability of installing carefully arranged hand-sorting stations preceding the mill. These plants may contain all of the preliminary breakers which

TABLE 4. TOTAL DIRECT SAVING DUE TO SORTING.

Year.	Savings on Milling Cost.				Savings on Tailings Loss.				Total Savings.
	Cost per Ton.		Saving per Ton.	Total for Year.	Loss per Ton Milled.	Assay of Sorted Waste.	Saving per Ton Sorted.	Total for Year.	
	Milling.	Sorting.							
1893	.....	.....	.....	.....	.....	$0.78	.....	.....	$ 33,200
1894	12 months ending March.				.....	0.94	.....	.....	95,600
1894	9 months ending December.				.....	1.06	.....	.....	71,500
1895	.....	.....	.....	.....	.....	0.97	.....	.....	112,000
1896	.....	.....	.....	.....	.....	1.00	.....	.....	136,000
1897	.....	.....	.....	.....	.....	0.49	.....	.....	117,000
1898	.....	.....	.....	.....	.....	0.83	.....	.....	204,090
1899	$1.93	$0.39	$1.54	$ 72,000	.....	1.08	.....	$ 32,000	104,000
1902	2.65	0.70	1.95	29,400	.....	1.34	.....	14,300	43,700
1903	2.08	0.72	1.36	66,500	$2.18	0.93	$1.25	61,000	127,500
1904	1.62	0.72	0.90	59,000	1.95	0.98	0.97	63,500	122,500
Total	.....	.....	.....	$226,900	.....	.....	.....	$170,800	$1,167,000

[1]Statement of Mr. Johns' results from 2¼- and 1in. grizzlies and results from Crown Reef mine, extracted from "The Witwatersrand Goldfield, Banket and Mining Practice," by S. J. Truscott.

otherwise would be installed in the mill, and the ore delivered to the mill bins would be ready for fine crushing. At most mines the ore, as hoisted from the mine, is delivered into ore bins with possibly one grizzly to screen out the fines.

From the experience in South Africa this single-stage sorting can be greatly improved upon by the installation of two or more grizzlies delivering sized products to the sorting bins. The ore from the bins will be delivered by gravity to the sorters, reducing by about 10 per cent. the amount of labor required in South Africa. The cost of sorting a sized product which has been previously washed is much less and furnishes a better product than sorting mixed sizes, as is our common practice. The fines from most ores are of a high grade and should be washed from the waste rock before discarding. This can be accomplished with a spray at the gate of the bin before sorting. Circular tables also warrant careful investigation from the great success attending their use in South Africa.

Conservation of Mineral Lands

SPECIAL CORRESPONDENCE

Preparations are being made in Washington for an active winter's discussion of the question of Federal relationship to coal and mineral deposits. This issue will be forced to the front as a result of the so-called Ballinger-Pinchot controversy, which was only temporarily set at rest by the letter in which President Taft sought to dispose of the difficulties that had developed between the two men. The setting aside of the personal aspects of the controversy is, in fact bringing into higher relief the difference in the policies advocated by the contestants, as well as the difference between the point of view of Secretary of the Interior Ballinger and that of his precedessor James R. Garfield. The main question at issue is now seen to have been the same which was raised last winter in connection with several bills then presented to Congress—that of continuing the sales of coal and other lands owned by the Government or of leasing the lands with the right to mine on a royalty basis. Both President Roosevelt and Ex-secretary Garfield, as well as Chief Forester Pinchot, are known advocates of the leasing plan. The position of Secretary Ballinger in opposition thereto and in favor of the plan of outright sales has been brought into a clear light in connection with the Alaskan phases of the recent controversy, especially the disputed "Cunningham claims." Mr. Pinchot's immediate connection with the matter is seen in the fact that some of the most valuable coal lands are now comprised within the limits of the national forests reserves, and are therefore directly under his charge. Mr. Taft has already undertaken to propose to Congress some legislation on the subject of "conservation," which in this instance is understood to mean the question of mining legislation. What his position will be is as yet uncertain as he has not definitely expressed himself upon general lines of policy.

Whatever position is taken by the President, the bill embodying it will be fiercely contested as the parties to the debate are quite evenly matched in the legislative body. The large number of bills brought before Congress a year ago and designed to introduce the leasing system in connection with various kinds of mineral deposits assume a new significance when they are thus made parts of a general issue which is now possibly to receive at least temporary settlement one way or the other. That the subject will be forced upon the attention of Congress in a way that will perhaps lead to the beginning of a Congressional investigation into coal and other mining conditions in Alaska is now highly probable. The Glavis report upon coal claims in Alaska, which afforded the principal bone of contention in the contest of the past summer, going through the President's own hands and serving as the basis for the final dismissal of Mr. Glavis from the service, will be given to the public within a very short time, so that it will be in the hands of members of Congress at the opening of the session. It is not clear that the opponents of Secretary Ballinger can succeed in forcing a Congressional investigation or, having secured its initiation, can carry it through. Should they succeed in their effort, there is reason to expect that it will be made the vehicle for much argument against the further alienation of Government mining and water rights and that it will be sought to build up legislation upon the facts exhibited during the investigation. Should the investigation be blocked by the leaders in either house, the same line of argument will be developed in other ways.

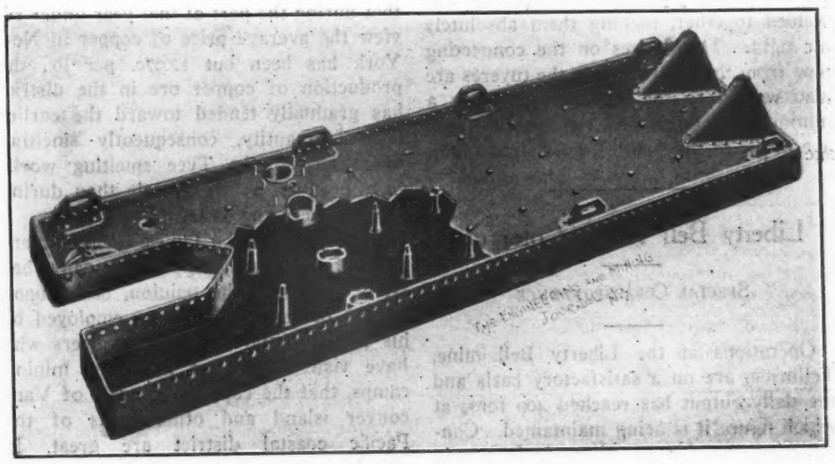
Unusual Treatment Problem

Owing to the fact that nearly one-half of the copper in the ores of the Panuco mines in the state of Coahuila, Mexico, is in the form of sulphate and black oxide, it has been necessary to work out a combined leaching and concentration method. The ore is low-grade and was opened up in an irregular manner to secure the high-grade ore which would stand wagon haul. The exposure of the sulphide ores, together with the effects of an underground fire, have made the alteration of the ore very extensive in the mine.

Elaborate experiments for the treatment of the ore have been made and it is hoped that before long a satisfactory method will be evolved. A short line of railroad connects the property with the National railroad. The mine belongs to the Continental Mining Company, of San Antonio, Texas, of which Arthur C. Tuttle is general superintendent.

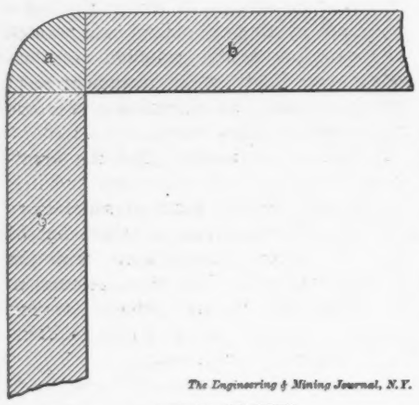
The Traylor Water Jacket

A blast-furnace water jacket without expanded nipples or rivets exposed to the cutting action of a charge of ore is one of the latest products of the Traylor Engineering Company, of Allentown, Penn. The two plates forming the jacket are pressed cold by a special 400-ton hydraulic press, and are then bolted or riveted together. By using the hydraulic press, three decided advantages are gained over ordinary methods for making water jackets. First, a uniform thickness of the plate; second, the side flanges are perfectly straight, and third, square corners are formed, allowing the plates to fit together closely when assembled. Wherever the edges of the plates are to be joined, they are brought together as shown in the drawing, where *b b* represents two plates. The space *a* is then filled with iron by the autogenous welding process. Thus, the two



NEW TRAYLOR WATER JACKET

plates are actually fused together forming a perfectly tight joint. It will be noticed in the photograph that the tuyere openings are an integral part of the lower plate, and that no stiffening bars, separators, or thimbles are required. Where necessary, the plates are stayed by the Hawkes patent stay bolts, making them as rigid as a boiler firebox. The jackets are tested



METHOD OF WELDING FURNACE JACKET

under an internal pressure of 25 lb. per sq.in., and are not weighted in any manner to prevent warping or irregular expansion.

In addition to welding the water jacket, all the bustle pipes for the furnaces are welded together, making them absolutely air tight. The flanges on the connecting pipe from the bustle pipe to the tuyeres are also welded to the pipe. This makes a minimum of joints and reduces the leakage of air to the smallest possible amount.

Liberty Bell Mine, Colorado

SPECIAL CORRESPONDENCE

Operations at the Liberty Bell mine, Telluride, are on a satisfactory basis and the daily output has reached 400 tons, at which figure it is being maintained. Construction, as far as planned, is nearly complete, and the new bunk house, offices and ore house at the Stilwell tunnel are said to be safe from any possible movement of snow.

The power equipment is now centralized in an underground transformer and compressor station. A single unit only of the electric haulage system is to be installed during November. The tramway handles the output without difficulty in 2 shifts.

Milling work will be unchanged except for the probable addition of increased settling capacity and concentrating surfaces. The operation of the Dorr continuous settlers during the last year has been entirely successful. Underground development, the results of which have been satisfactory, has been at the rate of about 750 ft. per month. It has been confined almost entirely to work within the vein.

The Tyee Smeltery as an Outlet for Pacific Coast Ores

BY E. JACOBS

During twelve months ended August 31, 1909, approximately 45,000 tons of ore were smelted at the Tyee Copper Company's smeltery at Ladysmith, Vancouver island, British Columbia. The matte produced contained about 3,500,000 lb. of copper. This was the largest production of copper at these works in any period of twelve months since the company's fiscal year ended April 30, 1905. The aggregate output of copper at this smeltery since 1902 is estimated at about 22,000,000 pounds.

Ore supplies are drawn from an extensive district, from as far north as Latouche, Alaska, and south as far as Salina Cruz, Mexico, consequently operations are not now, as formerly, entirely dependent upon the ore production of copper mines on Vancouver island and adjacent coastal districts of British Columbia.

After the fall in the price of copper in October, 1907. only a few of the better-equipped and higher-grade mines continued to ship copper ore to the smelters through 1908. In 1909, however, notwithstanding that during the part of that year under review the average price of copper in New York has been but 12.97c. per lb., the production of copper ore in the district has gradually tended toward the earlier normal quantity, consequently smelting operations at the Tyee smelting works have been on a larger scale than during several preceding years.

W. H. Trewartha-James, general manager of the Tyee Copper Company, has lately expressed the opinion, based upon reports of mining engineers, employed by his company and of other engineers who have visited some of the coast mining camps, that the copper resources of Vancouver island and other parts of the Pacific coastal district are great. It will be only a matter of time and the necessary expenditure of money in development work, together with the exploration of comparatively large areas as yet not easily accessible, and the provision of means of communication between the coast and the hinterland, ere there will be opened up deposits of copper ores exceeding in size and value any yet exploited in the district.

SUPPLY OF ORE INCREASING

The Tyee Copper Company during the last two years has been developing a number properties, some on Vancouver island and others situated at different parts of the coast district. While encouraging results have been obtained in several instances, none of these properties yet produce on a commercial scale. As, however, a commencement has been made to ship copper ores to this coast from such distant places as Korea and South America, a gradual increase in the supply of smelting ores is looked for. The better outlook for an increased ore supply, chiefly from the coast mines of British Columbia, southern Yukon and Alaska, and in small measure from distant foreign parts, has encouraged the management of the Tyee Copper Company to increase the capacity of its works by the installation of a second blast furnace.

The new Tyee furnace is 48x160 in. at the tuyeres, which are 6 in. in diameter and 22 in number. The blast is supplied by a No. 8 Connersville blower, capable delivering 14,000 cu.ft. of free air per min. at 2-lb. pressure. The blower is driven by a 12x24x30-in. cross-compound Corliss engine. This furnace was blown in last July, but it has not yet been operated to its full capacity, which is estimated at about 12,000 tons of ore per month, of course, dependent upon the character of the smelting mixture available. Taking the capacity of the old furnace at 8000 tons per month (it has smelted up to 330 tons per diem when running on a smooth mixture), the present total treatment capacity of the Tyee smeltery is about 20,000 tons of ore per month. Calculating the average recovery of copper, after allowing for slag losses, at 80 lb. per ton of ore, this would give a production capacity of 1,600,000 lb. of copper per month, or 19,200,000 lb. per annum, provided that sufficient ore could be obtained to keep both furnaces regularly in full blast.

The ore-handling arrangements at these works have been brought to a high degree of efficiency and economic working. The facilities for unloading ore arriving by water at the company's wharf are well ahead of present requirements, being equal to 1600 tons of ore per day; at short notice the plant could be made to handle an increased tonnage, additions that would be required not being important. Included in the hoisting appliances is an ingeniously contrived trolley, designed by W. J. Watson, smeltery manager. This trolley effectually does away with the customary jar occasioned by changing from vertical to horizontal movement of load when hoisting ore from a vessel, and repeated practical tests by continued use in ordinary ore-unloading operations have proved it well suited to the purpose for which it was designed.

Production of matte at Ladysmith is not yet sufficiently large to induce the Tyee Copper Company to install a converting plant, so the matte is shipped to the smeltery at Tacoma, Puget sound, Washington, to there be converted into blister copper and shipped thence to an eastern refinery.

Rescue Work at the St. Paul Mine

Pending the receipt of a full account of the accident at the St. Paul coal mine at Cherry, Ill., a brief review is given of the rescue work as outlined by the despatches up to the time of going to press. Upward of 300 miners were imprisoned in the St. Paul mine on Nov. 13, as a result of a fire starting from the ignition by an open torch of hay in the mine stable. At this writing, about 150 miners are still unaccounted for; 130 bodies have been found and 20 miners have been removed alive from the mine. Except those who escaped from the mine before the openings were blocked by smoke on Saturday, Nov. 13, no miners were removed alive until Nov. 20, one week later, when 20 miners who had walled themselves in in a large chamber off the second gallery, were brought to the surface alive. It is the opinion of those on the ground that there are others who followed the example of these men and who may yet be rescued.

The members of the first rescue party which entered the mine on the day of the accident, were lost with the exception of one man. That evening the main and ventilating shafts were sealed and on Nov. 14, rescue parties headed by R. Y. Williams, of the U. S. Geological Survey, and James Taylor, State mine inspector, made three descents without practical results. The rescue party was equipped with oxygen helmets and cylinders and on the first descent reached a depth of 60 ft. The shaft was filled with smoke, which the electric lanterns of the rescue party failed to penetrate. In the second descent a depth of about 300 ft. was reached, and on the third descent, the rescue party made a careful examination at the second level. The temperature in the shaft at this point was bearable but the atmosphere, without oxygen apparatus, was intolerable.

On Nov. 16, fire hose and engines were brought from neighboring cities and under the direction of Fire Chief Horan, of Chicago, water was turned into the mine. The temperature in the main shaft was reported at this time as 190 deg. F. a short distance below the collar. Later in the day the temperature in the main shaft was 111 deg., and in the air shaft, 68 deg. The following day two descents were made into the ventilating shaft and 20 dead bodies were found as the result of this exploration. At 5 p.m. it was decided to break the seal on the main shaft, this being followed by the belching of smoke from the shaft. The temperature was then about 90 deg. Shortly thereafter, a rescue party descended to the fatal second gallery, and though the safety lamps were not extinguished, the entrance was found to be blocked by mud and timbers.

On Nov. 19, five and one-half days after the accident, the first dead man was removed and on the succeeding day, the 21 miners who had walled themselves in in a large chamber on the second level were reached, and 20 of them were brought to the surface alive. On removing the débris from the trap door at the third east drift, a heap of bodies were found piled against the door, these men having evidently been killed by breathing the poisonous gases. On Nov. 22, 38 bodies were found in the east end of the second level. It was the opinion of the coroner's jury that these men had been dead less than 48 hours. A representative of the JOURNAL has been sent to the scene, and a full and authentic account will be given in a later issue.

Later—Practically all of the miners have been accounted for, and it is now almost certain that no more men will be saved. About 168 bodies have been discovered piled on and about a ladderway near the shaft in the lower level.

New England Coal Trade

A carefully prepared report just issued by the Committee on Fuel Supply of the Boston Chamber of Commerce gives some interesting details as to the consumption of coal in New England and the sources from which the supply is drawn. From this report we have compiled the accompanying table, showing the approximate quantity of coal delivered in New England in 1908, and the routes by which it reached that territory. The figures are in long tons.

COAL CONSUMPTION OF NEW ENGLAND

Receipts by Water.	Anthracite.	Bituminous.	Total.
Consumed at ports..	3,788,078	7,266,976	11,055,054
Reshipped by rail...	1,307,440	3,650,053	4,957,493
Total by water....	5,095,518	10,917,029	16,012,547
Receipts, all rail....	3,512,059	4,547,294	8,059,353
Total.....	8,607,577	15,464,323	24,071,900

The quantity entered above in the receipts by water as consumed at ports is undoubtedly too high, as it includes 2,065,000 tons of bituminous coal intended for the use of the railroads. There are no statistics to show how much of this was actually delivered to locomotives at the ports of entry, and how much was hauled to other points. Assuming that one-half of it was thus hauled, it would appear that 37.4 per cent. of the coal received by water was transferred to cars and hauled to other points by rail. The water receipts were 59.2 per cent. of the anthracite, 70.6 of the bituminous and 66.5 per cent. of the total coal. This large proportion is due to the extended coast of New England, the numerous ports, and the comparatively short haul from those ports to many—or most—of the consuming points. The low water rates from the coal-shipping ports over-balance the cost of the double transfer required.

The report makes a distinction between railroad and commercial coal—that is, the coal consumed in operating the railroads and that sold and supplied for domestic and factory use. These figures are as follows:

	Anthracite.	Bituminous.	Total.	Per Cent.
Commercial coal.....	8,607,577	11,074,323	19,681,900	81.8
Railroad coal..		4,390,000	4,390,000	18.2
Total.....	8,607,577	15,464,323	24,071,900	100.0

The quantity of anthracite consumed by the New England railroads is so small as to be practically negligible. It seems also safe to assume that at least 90 per cent.—probably more—of the anthracite received is for domestic consumption, few factories using anything but bituminous coal.

The origin of the bituminous coal used in New England is not given, but the receipts at Boston may, to a certain extent, be taken as typical. The total arrivals at that city in 1908, of domestic coal, were 1,776,401 tons of anthracite and 3,302,929 tons bituminous; a total of 5,079,330 tons, of which only 105,656 tons came by rail. The water receipts of bituminous coal were as follows:

	Tons.	Per Cent.
N. Y. and Philadelphia....	578,336	17.8
Baltimore and Washington	1,294,747	39.9
Newport News and Norfolk	1,367,479	42.3
Total.....	3,240,562	100.0

The receipts from New York and Philadelphia were mainly Pennsylvania coals— Clearfield and other central districts; those from Baltimore were from the Cumberland basin in Maryland and from Fairmont and adjoining districts in West Virginia; while the rest were Virginia and West Virginia coals. The imports of foreign coal at Boston last year were 370,709 tons, all but 509 tons coming from Nova Scotia. This is probably a very large proportion of all the Nova Scotia coal used in New England.

An interesting table shows the class of vessels carrying the coal delivered at the port of Boston in 1908; and here again Boston may be taken as typical of all the New England ports. The figures are as follows:

	Anthracite.	Bituminous.	Total.	Per Cent.
By steamers....	2,517	987,959	990,476	19.9
By sailing vessels.....	8,449	1,153,865	1,162,314	23.4
By barges.....	1,722,146	1,098,738	2,820,884	56.7
Total.....	1,733,112	3,240,562	4,973,674	100.0

This shows to what an extent the barges towed by sea-going tugs have taken the coastwise trade. They carry practically all the anthracite, most of those in that trade being owned by the coal companies. Sailing vessels still carry a good part of the bituminous coal; but steam colliers are taking a large share of it, and may be expected to take more when the Virginian railroad company carries out its plans of direct shipment. The average cargo delivered by steamers was 3931 tons each; by sailing vessels, 2801; by barges, 1457 tons.

Safety Fuses in France*

This paper embodies in a condensed form the facts ascertained in the course of an inquiry, instituted by the French Ministry of Public Works, into the utilization of safety-fuses, on account of certain accidents which had been attributed to over-rapid combustion of these fuses.

All the fuses employed in French mines are of home-manufacture, the annual output of the four factories in France where they are made averaging 30,610,000 yd. (in rolls of about 11 yd. or 10 m.). Rather more than two-thirds of this quantity is used up in the mother country, the rest finding its way to Algeria and the French colonies.

Whatever their source, the fuses may be ranged under various categories which have considerable mutual analogy, whether manufactured in France or in other countries. The method of manufacture, with the exception of some trifling details, seems to be much the same everywhere. The exterior envelop, in regard to the combination of the materials of which it consists, appears to admit of considerable variation: but the envelop, however it is made, seems to have no effect whatever on the rapidity of propagation of ignition.

This rapidity of propagation may vary with the chemical composition, the granular texture, and the hygrometric condition of the gunpowder in the fuse. It may also vary according to whether the fuse is freshly made or stale, or according to whether the latter has been kept in a dry place or a damp one, in a cool atmosphere or a heated one. It has been shown by the experiments that this variation may range in time, for fuses burning in the open air, between 40 and 150 sec. The general average, corresponding to the conditions obtaining on the whole in mining practice, would appear to be about 100 sec. in the open air, both for French fuses and for those from other countries which were subjected to identical tests.

A Comparison of Fuses

Mr. Loiret compared two fuses, first after they had been stored in a very dry place, and then after they had been exposed for a long time in a very damp part of the mine; he got for one of them 85 sec. and 100 sec. (or a reduction of 17 per cent.); and for the other 109 sec. and 150 sec. (or a reduction of 45 per cent.). Mr. Aron, by warming fuses in the sunlight or in a stove, got variations amounting to a maximum of 30 per cent. He found also, that when a fuse is burned in the open air and strongly pressed under foot, or squeezed in a vise, a loud explosion takes place when the ignition reaches the compressed portion, and generally too when the ignition leaves the compressed portion to travel farther on. Mr. Aron, assuming that energetic compression of the fuse might induce acceleration of the speed of ignition, placed a fuse within an iron tube, closed at one end by an iron slide and well stemmed with plastic material. He obtained in this way a speed acceleration of 500 per cent., or say a speed of at least 19 sec. per yard. These experiments were repeated in the live rock, under ordinary conditions of working, and with appropriate stemming, speed accelerations amounting to as much as 296 per cent. were obtained. The experiments made by Mr. Champy, assistant general manager of the Anzin Colliery Company, in the main confirmed Mr. Aron's results. From this it may be concluded that there is a general similarity between all the fuses obtainable in commerce, in regard to their speed of ignition; but the possibility of considerable variations in the normal speed of a given fuse is not excluded, owing to the intervention of such factors as its intrinsic character, its actual state at the time of use and the manner in which it is used, and especially the conditions and mode of stemming.

Attention Called to Defects

The defects to which attention is directed are of three kinds: (1) Defects involving too great a speed of propagation, and conseqently premature explosions which might prove particularly dangerous; (2) defects occasioning too slow a speed of propagation or else miss-fires, with results to be described rather as vexatious than as dangerous; and (3) defects causing lateral spurting. Notwithstanding the recent great fall in price (nearly 50 per cent.) of fuses, the investigation has shown that the defects enumerated above are no more frequent now than at any previous time; nor are the fuses of one manufacturer, on the whole, more open to criticism than those turned out by another.

Lateral spurting is declared to be a matter of interest and importance in the case of fiery mines alone. To what extent it is dangerous even there, is a question that can only be settled by direct experiment.

Passing over the defects which occasion miss-fires—and most factories are so equipped as to discover these by manual or by mechanical means—the report deals with the defects which, by exaggerating the speed of ignition, may cause premature explosion. It will be noted, however, that it has, in no case where an accident was really or supposedly assignable to this cause, been possible to establish beyond doubt that there was an actual defect in the make of the fuse. Subsequent experiments on the very same roll of fuse have only shown it to possess the normal speed of ignition. Whence it may be inferred that such accidents are more justly assignable to the conditions under which the fuse is employed; it has already been pointed out that these conditions, from those concerning the state of preservation of the fuse, to those concerning the stemming or the particular length employed, may involve variations, even in a quite normal fuse, sufficient to account for the most unpleasant surprises in the nature of premature explosions. Lengthening of the fuse might diminish the risk; but there is always a risk inherent in the use of any fuse, despite the immense progress which it has involved in the comparative convenience and security with which explosives may be handled.

At the Anzin collieries, about 0.5 per cent. of every delivery of fuse is tested in the dark (to ascertain whether there is lateral spurting). Fuses of too low or too high a speed, or which do not ignite with sufficient regularity, are left on the maker's hands. Various collieries in the Pas de Calais and in other parts of France also test the fuses on delivery.

The committee of inquiry was unanimously of the opinion that such tests should be made obligatory by ministerial decree, but appears to have been somewhat divided as to the particular formulas that should be set up as standards.

*Abstract of article published in *Annales des Mines*, 1907, Series 10, Vol. XI, pages 252-263.

Use of Fuels in Locomotives

Special Correspondence

The U. S. Geological Survey has completed, and will shortly distribute, a bulletin giving the result of experiments conducted during the past year with a view to contributing to the solution of the special problems of combustion in locomotive boilers. The bulletin has been compiled because of the fact that the coal used on the railroads of the United States is over one-fifth of the coal production of the country so that "any small saving that can be made effective * * * at once becomes an important factor in conserving the fuel supply of the nation."

Experiments for the purpose of dealing with the fuel question were conducted in the locomotive-testing laboratory of Purdue University and the coöperation of the Survey has consisted in detailing experts to assist the regular staff of the laboratory in the chemical and calorific work of the tests. These experts became responsible for the sampling of smoke-box gases, the cinders caught in the front end of the locomotive and the refuse caught in the ash pan. The experiments were carried on with two classes of coals, both of good quality. The following

table gives a general summary of the results obtained in the experiments, translated into terms of tons on the basis of an assumption that the roads annually consume 90,000,000 tons of coal.

SUMMARY OF RESULTS OBTAINED FROM FUEL BURNED IN LOCOMOTIVES.

	Tons.
1. Consumed in starting fires, in moving the locomotive to its train, in backing trains into or out of sidings, in making good safety-valve and leakage losses, and in keeping the locomotive hot while standing (estimated)	18,000,000
2. Utilized, that is, represented by heat transmitted to water to be vaporized	41,040,000
3. Required to evaporate moisture contained by the coal	3,600,000
4. Lost through incomplete combustion of gases	720,000
5. Lost through heat of gases discharged from stack	10,080,000
6. Lost through cinders and sparks	8,640,000
7. Lost through unconsumed fuel in the ash	2,880,000
8. Lost through radiation, leakage of steam and water, etc.	5,040,000
	90,000,000

As to this showing the experimenters conclude: The amount of fuel consumed in preparing locomotives for their trains, etc. (item 1), is dependent only to a very slight extent on the characteristics of the locomotive, being in large measure controlled by operating conditions, by the length of divisions, and by the promptness with which trains are moved. Under ideal conditions of operation much of the fuel thus used could be saved, and it is reasonable to expect that the normal process of evolution in railroad practice will tend gradually to bring about some reduction in the consumption thus accounted for.

The fuel required to evaporate moisture in the fuel (item 3) and that which is lost through incomplete combustion (item 4) are already small and are not likely to be materially reduced.

The loss represented by the heat of gases discharged from the stack (item 5) offers an attractive field to those who would improve the efficiency of the locomotive boiler. So long as the temperature of the discharged gases is as high as 800 deg. F. or more there is a possibility of utilizing some of this heat by the application of smoke-box superheaters, reheaters, or feed-water heaters, though thus far the development of acceptable devices for the accomplishment of this end has made little progress.

The fuel loss in the form of cinders collecting in the front end and passing out of the stack (item 6) is very large and may readily be reduced. The results here recorded were obtained with a boiler having a narrow fire box; the losses in the form of cinders would probably be smaller with a wide fire box. A sure road to improvement in this direction lies in the direction of increased grate area.

The radiation and leakage losses (item 8) may in part be apparent rather than real, owing to possible inaccuracies in the process of developing the heat balance. On the assumption that the values are correct as stated, however, it is not likely that under ordinary conditions of service they can be materially reduced.

Locomotive boilers are handicapped by the requirement that the boiler itself and all its appurtenances must come within rigidly defined limits.

Explosion in Anthracite Mine

SPECIAL CORRESPONDENCE

Five miners perished, Nov. 9, when they were imprisoned by a wall of flame which swept through the Auchinloss colliery of the Delaware, Lackawanna & Western Coal Company, at Nanticoke, seven miles below Wilkes-Barre, Penn. The flames were subdued by the rescuing party after a long struggle, and the five dead bodies were removed from the shaft. The mine officials took an inventory of the safety lamps used by the employees and found that two more men were within the affected region.

The blaze followed an explosion of gas in the Ross vein late that afternoon and spread with such rapidity that two miners were overtaken by the flames and were barely rescued by a force of mine workers, who wrapped their coats about their heads and dashed in for them. One of the miners was so badly burned that he died before he could be taken from the mine, and the other man cannot live.

Beyond the point where the explosion occurred were five mine workers, and these were cut off from the outlet to safety by the flames.

Difficulties in the Way of Improving Explosives in Use

SPECIAL CORRESPONDENCE

According to statements made by officers of the U. S. Geological Survey, one of the chief difficulties that is being encountered in the work of securing the adoption of permissible explosives in mines for the purpose of reducing the danger of accident is the attitude that is being taken by trades-union authorities. Three States have now officially adopted the list of permissible explosives which has been published by the Geological Survey as the result of its work in explosives testing—Pennsylvania, Alabama and West Virginia. These States, however, will be greatly hampered if the unions seek to deal with the matter through political channels. The position which is being taken by the union men according to the officials is that, inasmuch as the permissible explosives tend to shatter the coal considerably more than black powder would, they lessen the earning power of the miners, and are hence to be antagonized.

The California Coal-Mining Industry

SPECIAL CORRESPONDENCE

The coal-mining companies started in California in recent years seem to have been playing in "hard luck," as none of them have been productive and they have become involved in litigation. Even the older coal properties, such as those at Pittsburg, usually called the Mount Diablo mines, are doing little or nothing compared with previous activities. The most promising of the new companies was the Stone Canyon Coal Company, about 22 miles from Bradley, Monterey county, where the coal was supposed to be of much better quality, and in larger bodies than in other California coal mines. Considerable money has been invested in this property in development and machinery, and for a time the coal was largely advertised in the San Francisco papers as a material adapted for domestic production which could be bought for less than the imported coals generally in use in California.

The attempt to introduce the coal in large quantities was evidently a failure. A suit to have a receiver appointed, brought before the United States Circuit Court in San Francisco, resulted in the closing down of the mines, and now this is followed by a suit in the same court praying for a receiver for the Stone Canyon Pacific Railroad Company, which was built to carry the coal from the mine to the trunk-line road at Chandlor. There is nothing else for the railroad to do except to carry the coal from this mine, and the Guaranty Trust Company, of New York, asks the court to take cognizance of its claims on an auxiliary mortgage of $1,385,000 in case a sale of the road is made. The original or purchase-money mortgage fell due when the coal company failed to mine at least 200 tons of coal daily, and no interest has been paid on bonds amounting to $530,000. In fact, the mine was expected to furnish at least 1000 tons of coal daily, but this it has not done, no market for it having been found in the short time during which active operations have been carried on.

The Monterey Coal Company, whose properties are supposed to be on the same coal belt as that of the Stone Canyon Company, is also involved in litigation due to controversies among the stockholders. Some of the principal ones have bought up certain gas and electric and street-railroad companies in towns in Monterey county, and it is their ultimate intention to make producer gas from their coal with which to generate electricity to be furnished to the towns in the county, and possibly later, to cities on San Francisco bay. Meantime no work of mining coal is being done at the mines.

Review of Coal Mine Accidents in Europe

A book has recently been issued containing the report of a committee appointed by the British Royal Commission on Mines to inquire into the occurrence and prevention of accidents from falls of roof and side, underground haulage and shaft accidents. The report was prepared by the three mining engineers, R. G. S. Redmayne, chief inspector of mines, A. M. Lamb and W. Walker, who composed the committee. It contains much useful information regarding accidents in mines and their prevention, obtained from visits to a number of the principal collieries both in England and on the Continent. The report, which is liberally illustrated, forms a valuable textbook of modern practice as regards the special subjects treated.

Japanese Coal*

The amount of coal produced in Japan in the first half of the present year was 6,445,959 tons, an increase of 318,418 tons, or 5.2 per cent., as compared with the corresponding period of the last year. The output of coal in Hokkaido during the period amounted to 824,000 tons, an increase of only 20,000 tons as compared with the corresponding period of last year.

Latest report puts the amount of coal produced in Japan at over 13,000,000 tons per annum, nearly 60 per cent., or over 7,000,000 tons of which are mined in Kiushu. Of the total output of Kiushu, over 35 per cent., or nearly 2,500,000 tons, are exported to Singapore and the north. In other words, Kiushu, Miike, and other Japanese coals are at the present time swaying the Oriental coal market. The chief markets of Kaiping coal are Tientsin and the vicinity where nearly 300,000 tons are disposed of, and the remainder (1,200,000) is exported to Ching-Wang-Tao and South China generally as far as Hongkong and Singapore. Looking at the future of Fushun coal, its output is only 2000 tons per day, but the South Manchurian Railway company is planning to mine 5000 tons daily or 1,800,000 tons per annum from 1912 when Oyama and Togo mines are opened. The company consumes 300,000 tons for its own railway and the regular customers take 350,000 tons per annum, and the remaining 1,150,000 tons must be disposed of in the foreign markets. In three years Kiushu and Kaiping coals would, of course, be competing in the Far Eastern market. Moreover, the output of Tsing-Tau coal produced in Kiao amounts to 600,000 to 700,000 tons per annum, and its output would be still greater in three years from now and may even come into competition.

*Hongkong correspondence of London *Colliery Guardian*.

The cost of production of Fushun coal is cheaper than that of Kaiping coal, and still more so as compared with that of Kiushu coal. Therefore, Fushun coal would stand in the best position in the competition of the foreign markets so long as the freight of the above coals is the same as that of Fushun coal, and it would finally be the king in the East from Hongkong in five or six years from now.

An Excellent Market for American Coal in Chile

The American consul in Valparaiso reports there is an excellent opening for American coal in Chile. About 1,500,000 tons of foreign coal are consumed yearly in that country, of which England and Australia supply the greater part. The price on shipboard in Chile varies from $6.56 to $9.24 per ton.

Much complaint is heard because of the poor condition in which the American coal arrived in Chilean ports in the past. They say it is too fine and that it crumbles too easily, even though it does arrive in lumps, it does not stand handling. It would pay to study this trade, as Chile offers from $8,000,000 to $10,000,000 worth of coal business that American interests should share.

During 1908 the imports from the United States were 9691 tons in a total import of 1,599,614 tons, of which 544,018 tons were landed at the port of Valparaiso. There is no duty on coal.

Colliery Notes

It is reported that the output of coal in British India in 1908 was 12,149,026 tons; an increase of 1,622,558 tons as compared with 1907. More than 95 per cent. of the entire output was produced in Bengal. Indian statistics give the tons mined per year per person employed as follows: India, 101; England, 290; the United States, 596.

In several of the Illinois mines, where naked lights are permitted, acetylene pit lamps are being used instead of oil. These lamps cost the men $1 each and carbide is furnished at 10c. per two-pound can. The expense for maintaining these lights is from 1c. to 1½c. per day, which expense is less than the cost of oil for the ordinary lamp. The acetylene lamps give off no smoke and consume less oxygen.

Judge Henderson, of the Pennsylvania Supreme Court, sets forth in an important opinion, the liability of coal companies which dump refuse and culm into a river that later floods private property and causes damage. The opinion is in the case of H. W. Pierce against the Lehigh Valley Coal Company, and reverses Judge Ferris, of Luzerne county. Mr. Pierce sued on the ground that several acres of his land were ruined by culm washed onto it in flood time. He charges that the culm came from the Dorrance and Prospect collieries.

About 40 per cent. of all the coal produced in the United States is cut by machinery, while in England less than 10 per cent. of the output is machine mined. Many English operators claim that their coal seams are not favorable to the use of machinery, and the old system of undercutting by hand is generally practised. As the tendency of coal-mine managers everywhere is toward the saving of time and labor, it is certain that before long a machine will be designed which will undercut English seams satisfactorily. The antiquated method of undercutting by manual labor will then disappear quickly.

After many unsuccessful efforts to extinguish a mine fire that started 50 years ago in one of the Lehigh Coal and Navigation Company's mines in the Panther Creek region of Pennslyvania, it is believed that the problem has been solved. Flushing and flooding the burning area have failed to extinguish the fire, so the mine management undertook to separate the burning coal from the virgin territory by building a fireproof concrete wall, 12 ft. thick and 1050 ft. long. Building this wall was a tremendous task, for an open cut of such size was practically impossible. The plan pursued was to sink a series of shafts in exact line until the coal seam was reached. The foot of these shafts was connected, the wall built and the coal seam thus cut in two. It is estimated that when this work is finally completed the total cost will amount to at least $250,000. It is claimed that this expenditure will save 400,000,000 tons of anthracite coal.

Aluminum coated sheets in corrugated form, made by the Wilder Metal Coating and Manufacturing Company, Connellsville, Penn., have been specified for the new coal tipple of the Isabella-Connellsville Coke Company, at Arensburg, Penn. The sheets made by this process were adopted after an exhaustive investigation by George S. Baton and Company, civil and mining engineers, Pittsburg. The company advises us that it was found, that the sheets were impervious to weather and atmospheric conditions around coking plants. The metal was placed in running mine water, together with copper. The sulphur water left only a shadow of the copper, while the aluminum coated sheet was not apparently injured. Several years ago pipe was thus coated and placed in a Connellsville mine where the sulphur water was the strongest, and after years of service it was found to be in perfect condition, having outlived three black pipes and apparently in condition to last again as long. It is recommended by the manufacturers that the metal be not painted, unless painting is desired, and they give a guarantee of 10 years' service without the metal showing any signs of corrosion.

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Illustrated.

The St. Paul Mine Disaster

But little further is yet to be said of the terrible accident at the St. Paul mine at Cherry, Ill. The attention of the rescuing parties so far has been entirely taken up in the search for survivors and bringing out the bodies of the dead. From 75 to 80 bodies are reported as having been taken out up to the latest accounts. On Nov. 20, just one week after the accident occurred, a rescue party succeeded in forcing its way into a chamber in the workings where they found 21 men still living. As was to be expected, most of these men were in terrible condition; one died after being brought up to the surface, and several others are in a critical state. These men had either been working in the chamber, or succeeded in making their way there before it was closed off from the rest of the mine by a wall, and it is to this that they owe their escape from the fire and gas. They had lived for a week without food and with only very small quantities of water, which leaked through crevices in the walls of the chamber and which they were able to collect. The air, of course, soon became vitiated and their sufferings were very great.

Probably the only parallel to this rescue can be found in the great disaster at the Courrières mine, in France, in March, 1906, when over 1000 men were killed. In that mine 18 men were taken alive from a chamber 20 days after the accident occurred. They had managed to survive after terrible suffering, and were brought to the surface still living.

It appears that the second opening, or air shaft, of the St. Paul mine was only 300 ft. distant from the main shaft, and consequently it was closed immediately by the fire in the same way as the main shaft was. Had this second opening been at a greater distance it is probable that many lives might have been saved.

Calaveras Copper Company

A new offering to the public, this week, is 50,000 shares of the treasury stock of this company at $5 per share. The capital of the company is $5,000,000, divided into 1,000,000 shares, of which 550,000 are outstanding and 450,000 are in the treasury. There is also an issue of $450,000 of 6 per cent. bonds. The present sale of treasury shares is to provide working capital. After these have been allotted, says the prospectus, an active market for the stock will be made through the purchase and sale of the stock now held by those who have secured the property from the Ames estate; and it is the belief of these owners that the public will put a much higher value than par upon the stock when it is known that it can be obtained only in the open market. The prospectus further states that "when the new conditions" are established in the copper industry "a stock with the merit of Calaveras should return fair dividends upon a price of $35 to $45 per share."

The prospectus contains an engineering report by Josiah H. Trerise, who is a director of the company.

This company really possesses a mine, and the stories that are told as to its long and picturesque history are substantially correct. However, there are some points in the prospectus that are open to criticism. It is stated that refined copper will nearly always command on the Pacific coast a price of 1c. per lb. in advance of the Eastern market. This has previously been assumed by engineers who have examined this property, but G. McM. Ross, formerly manager of it, said in the JOURNAL of March 14, 1908, that this could not be done. On the contrary, a large production of refined copper on the Pacific coast would have to be sold at less than New York quotations.

Mr. Trerise estimates that the mine has 400,000 tons of ore, averaging 4 per cent. copper, on the dumps and developed underground. The present plant is estimated to be capable of treating 360 tons of ore a day, producing about 8,000,000 lb. of copper per annum, the ore reserves being consequently about three years' supply. However, Mr. Trerise goes on to reckon 10,000,000 tons of ore, averaging 3 per cent. copper, as "ore proven," though at first he qualifies it as "probable ore." Later on he considers it to be simply "ore proven" as distinct from the "developed ore," and he indicates that it will be an easy matter to increase the production to 17,000,000 lb. per annum, and even to 35,000,000 pounds.

The evidence adduced hardly gives us confidence in the proven character of the 10,000,000 tons ore, nor does our previous knowledge of the lens character of these deposits. The mine has not, in recent years, produced anything like 8,000,000 lb.

of copper per annum, and for a good deal of this time, even until recently, it has been idle. Surprise has been expressed that it should have been allowed to remain idle in view of the actual development of ore, and it is likely that the mine can, under good management, yield some profit, but that it can be quickly developed into a great copper producer we do not think the evidence is yet satisfactory, and we have our doubts as to its ability to produce at 8c. per lb. However, assuming this for sake of argument, there would be about $2 per share (issued) recoverable in three years from the ore developed on basis of 13c. copper, besides which there are the bonds, issued in part payment for the property to the Ames estate, to be taken care of. With respect to the 10,000,000 tons of "ore proven," the officers of Calaveras Copper Company are much too vague.

The Coming Copper Consolidation

The plans for this much discussed project have not yet been announced. We do not believe that they have been fully formulated. We do not believe that anyone outside of the principals knows precisely what is contemplated. However, guesses are the order of the day.

We surmise there will be a new holding company with a capital of preferred and common stock. This company will probably take over the mining interests at present controlled by Amalgamated and Cole & Ryan, together with Nevada Consolidated and Utah Copper Company, commonly known as Guggenheim interests, although the Guggenheims are not believed to be in control of Utah Copper Company. The copper mining interests of J. P. Morgan & Co., will probably be absorbed, and the recent behavior of the stock of Boston Consolidated indicates that it, too, may be taken in.

The new company will probably absorb the United Metals Selling Company and the International Smelting and Refining Company. We do not believe that the American Smelting and Refining Company and American Smelters Securities Company will be absorbed bodily, because they would cost too much and the chief interest of the former is not in copper. However, the new company may take over the Guggenheim copper refineries or may make a contract with them for the disposal of the comparatively small amount of copper that will remain after the Nevada and Utah outputs have been taken away.

The new company is expected to control a large percentage of the copper production of North America, which means a large percentage of the world's production, and by a curtailment of output on its own account elevate the price for copper sufficiently to pay dividends on the present water plus the water that may be added; and convert into marketable form a good many securities that a good many persons are tired of keeping. It is argued that the manufacturers of copper will not mind a higher price, indeed will rather like it (of course the consumers don't count), so the project is quite philanthropic, but discussion of its beauties is obviously best deferred until we are permitted to behold them.

The Ely Central Affair

We have received a great many letters in approval of our exposure of the promotion of this company, which led to a fall in its stock from about 4¼ to about 1½. We have received only two letters in dissent. The writers of these, who were both purchasers of stock in the company, complain that we depreciated their investments. We should similarly depreciate an investment in counterfeit money, if we showed it to be counterfeit.

As for the Ely Central property, O. A. Turner, president of the company, in a public statement virtually admitted what we said about it. He admitted that the showings of ore in the Monarch and Clipper shafts are but "prospects," and that the continuation of the Nevada Consolidated orebodies has not been proved, but thinks that it may be proved on the strength of some geological theorizing.

Consequently we have reduced the claim for this property from a porphyry orebody of 33,000,000 tons (exceeding the development of Nevada Consolidated in its three mines after more than five years of work) to some prospects and a geological hypothesis. This was the shadowy basis upon which poor people were being led to buy the property upon a valuation of $5,000,000, to which it had been boosted from $1,000,000 in eight weeks. The deluded investors were simply taking the property off the hands of its tired owners at enormous profit to them and to some unprincipled "promoters." The part of the public money that was going into the property for development was a mere bagatelle—a pitiful $36,000—but the philanthropists conducting the operations were going to ask the public to supply $600,000 more, minus a rake-off, to try to make something out of its own $5,000,000 property.

The explorations that are now in progress may find a payable orebody and may not. Whatever be the result, it has nothing to do with the case. The latter pertains solely to the attempt to sell an unproved prospect at the price of a developed mine.

The Aluminum Company

The Aluminum Company of America has declared a stock dividend of 500 per cent., which will increase its capital from $3,200,000 to $19,200,000. The company is said to have been paying 12 per cent. upon its outstanding stock of $3,200,000. When the Payne tariff was under discussion, an officer of this company stated that the aluminum business had been only ordinarily profitable, dividends having been paid in but 11 years out of 20, and the average dividend for the 11 years having been only 8 per cent: on a very conservative cash capital, making an average return to the stockholder of less than 4½ per cent., while during 1908 no dividend was paid. Consequently, the company did not see how it could get along if the previous duty of 8c. per lb. on ingot aluminum was reduced by more than 1c. per lb. However, the tariff business is now out of the way, wherefore, conditions are obviously different.

Who Owns This Paper?

We have observed recently in some Nevada local newspapers the expression of an idea that the ENGINEERING AND MINING JOURNAL is owned, controlled or influenced by "the Guggenheims." This is no doubt as amusing to "the Guggenheims" as it is to us and our intelligent readers. The JOURNAL is owned by the Hill Publishing Company. The entire capital stock of the Hill Publishing Company is owned by its officers and employees, and they are owned by no one but themselves.

The Standard Oil Decision

The decision in the Standard Oil case, filed in the United States Circuit Court at St. Louis on Nov. 20, is one of great importance, not only to that company, but also to other mergers and combinations to which the anti-trust law may be held to apply. The case was heard in St. Louis in April last, but the proceedings began three years ago. The hearing was before a full bench, Circuit Judges Sanborn, of St. Paul, Van Devanter, of Cheyenne, Hook, of Leavenworth and Adams, of St. Louis. Judge Sanborn, of St. Paul, the presiding judge, wrote the opinion and the decree, in which all the judges concur.

The Decree

The Court supports the contentions of the government in the suit, and decides that the Standard Oil Company of New Jersey, the main defendant, is an illegal corporation within the terms of the law. It is ordered that the company be dissolved within 30 days and its assets distributed to their former owners, a perpetual injunction against the defendant being also granted.

It is not expected, however, that this decree will be carried into effect immediately. In a case of this importance an appeal will undoubtedly be taken to the United States Supreme Court, and some time must elapse before it can be heard and decided by that court.

The Case

The government filed its complaint in November, 1906, before the United States Circuit Court for the Eastern District of Missouri. The complaint was directed against the parent organization, known as the Standard Oil Company of New Jersey, with its various subsidiary corporations. It was also directed against seven individuals, John D. Rockefeller, William Rockefeller, Henry M. Flagler, Henry H. Rogers (now deceased), John D. Archbold, Oliver H. Payne, and Charles M. Pratt. The main company, its branches, and these individuals were charged in the complaint with having entered into an agreement, combination, and conspiracy to restrain trade and commerce among the several States, to monopolize the trade in petroleum, both in its purchase and its shipment and transportation by pipe-line steamships and by rail, also in the manufacture and refining of petroleum.

The United States asked for a perpetual injunction, and for the dissolution of the Standard Oil combination. Hearings were held in New York, Washington, Chicago, Cleveland and St. Louis, about 400 witnesses being examined. The testimony was voluminous and the arguments were also extended, the former filling over 10,000 printed pages, and the latter 300 pages.

A syllabus of Judge Sanborn's decision —in which the three other judges concur— is as follows:

The Decision

"Congress has power under the commercial clause of the Constitution to regulate and restrict the use in commerce among the several States, and with foreign nations, of contracts, of the method of holding title to property and of every other instrumentality employed in that commerce, so far as it may be necessary to do so, in order to prevent the restraint thereof denounced by the Anti-Trust act of July 2, 1890 (26 Stat. 29).

"Test of the legality of a combination under this act is its necessary effect upon competition in commerce among the States or with foreign nations.

"If its necessary effect is only incidentally or indirectly to restrict the competition, while its chief result is to foster the trade and increase the business of those who make and operate it, it does not violate that law.

"But if its necessary effect is to stifle or directly and substantially to restrict free competition in commerce among the States, or with foreign nations, it is illegal within the meaning of that statute.

" The power to restrict competition in commerce among the several States, or with foreign nations, vested in a person or an association of persons by a combination, is indicative of the character of the combination, because it is to the interest of the parties that such a power should be exercised and the presumption is that it will be.

"The combination in a single corporation or person, by an exchange of stock, of the power of many stockholders holding the same proportions respectively, of the majority of the stock of each of the several corporations engaged in commerce in the same articles among the States, or with foreign nations, to restrict competition therein, renders the power thus vested in the former greater, more easily exercised, more durable, and more effective than that previously held by the stockholders, and it is illegal.

"In 1899 the stockholders of the Standard Oil Company of New Jersey owned a majority of the stock of 19 other corporations in the same proportions that they owned the stock of the Standard Company, and those 20 corporations controlled by the ownership of the majority of their stock or otherwise many other corporations. Each of these corporations was engaged in some part of the business of producing, buying, refining, transporting and selling petroleum and its products, and they were conducting about 30 per cent. of the production of the crude oil and more than 75 per cent. of the business of the purchasing, refining, transporting, and selling petroleum and its products in this country. Many of them were engaged in commerce in these articles among the several States and with foreign nations, and were naturally competitive.

"During the 10 years prior to 1879 the seven individual defendants had acquired control of many corporations, partnerships, and refiners that had been competing in this business, had placed the majority of the stock of those corporations and the interests in property in business thus obtained in various trustees to be held and operated by them for the stockholders of the Standard Oil Company, one of the 19 companies in which the individual defendants were principal stockholders, and had thereby suppressed competition among these corporations and partnerships.

"In 1879, they and their associates caused all the trustees to convey their interests in the stock, property and business of these corporations to five trustees, to be held, operated and distributed by them for the stockholders of the Standard Company of Ohio. From 1879, until 1892, they prevented these corporations and others engaged in this business, of which they secured control, from competing in this commerce by causing the control of their operations and generally of a majority of their stocks, to be held in trust for the stockholders of the Standard Company of Ohio, and, from 1892, until 1899, they accomplished the same result by a similar stock-holding device, and by the joint equitable ownership of the majority of the stocks of the corporation."

It will be seen that the right of the government to bring suit under the law is not questioned, and that the main contentions involved in the original complaint are upheld.

Progress of Transvaal Stope Drill Competition

By E. M. Weston*

The underground trials in connection with the competition for drills weighing under 100 lb. for a prize of £4000 given by the Transvaal government and the mining interests have now been proceeding since the middle of June. A table of results until Oct. 1 was published in the Journal of Nov. 20, 1909. Several interesting conclusions can be drawn from the results already published. It will be seen that the number of competitors has now been reduced to six, and of these six only one is a hammer drill. The two American hammer drills, the Waugh and the Murphy, soon retired. The Climax Imperial, built largely in imitation of the general design of a piston drill, alone survives, and the records show a comparatively poor performance.

The agent for one of the American drills expressed the opinion that the present conditions of underground labor and supervision were unsuitable to the employment of any water-feed drill using hollow steel. Great difficulty was experienced in getting drill steel, especially hollow drill steel, properly tempered to stand, and in obtaining a continuous supply of water to the working stopes. He claimed that ineffi-

*Mining engineer, 20 St. Mary's buildings, Johannesburg, South Africa.

cient miners damaged machines and hose, and that when the machines were in use the consumption of water was excessive because it was not intelligently used.

PISTON DRILLS SUPERIOR

This agent has abandoned his endeavors to introduce a water-feed hammer drill and has turned his attention to the design of a suitable piston drill. Generally speaking, the tests with new piston drills against new hammer drills as described in an article in the JOURNAL of May 15, 1909, showed that the piston drill was, if anything, the more effective machine, using less air to do a given amount of boring; this appeared surprising and the results of these trials will make mining engineers on the Witwatersrand loth to try any new water-feed hammer drill in the future.

With skilled labor and under conditions in which the steel used could be carefully retreated and the temper drawn, and with an adequate and continuous supply of water free from acids, their greater portability and the ease with which drills may be changed would enable hammer drills to hold their own with piston drills, but here these conditions do not exist. The ordinary air-feed type of hammer drill using solid steel is, however, being successfully introduced by the Waugh Drill Company, and this machine is doing good work in putting up raises and bore holes, and greatly reduced the cost of this work in several mines. The liberal use of vanadium steel for anvil blocks has done much toward making this type of machine reliable.

The Konomax drill, described in the JOURNAL of May 1, and May 15, 1909, has the distinction of boring rocks with the minimum expenditure of power of any known machine, but it failed in the competition for apparently two reasons: (1) It was not powerful enough, with a cylinder diameter of only 2 in. and a stroke of only 4 in., to compete with drills having a 2¾-in. cylinder and 6-in. stroke; (2) owing to its requiring water under pressure it was at the same disadvantage as the hammer drills in many respects.

FINAL RESULTS STILL DOUBTFUL

With regard to actual footage drilled per machine underground, full particulars have not yet been made public. The drills average only about 30 ft. per shift, though as much as 132 ft. has been drilled in a 9-hour shift by two machines of the Siskol type. The two Holman drills are supposed to be leading in total footage, but the air consumption is somewhat above that of the Chersen and Siskol drills.

As, however, all these figures giving air consumption depend largely on the number of new parts that have been put in to replace worn parts, and as the ground in some mines is more favorable for attaining large footages than others, the final result is somewhat hard to predict. One result will, I think, be safe to predict, and that is that the final type of piston drill for small stopes will not be a machine weighing only 100 lb. and will probably not make any pretense of being a one-man drill. The Siskol drill, which is of German make, presents some novel features of design which I hope to describe in a future article.

The Tariff on "Scrap"

In the JOURNAL for Nov. 6 comment was made on the tariff provisions on scrap iron and steel, and on the Treasury Department decision that under the new law no scrap iron or scrap steel is entitled to classification under paragraph 118 unless it is unfit for use until reduced by heat from a solid to a fluid state; therefore, that scrap iron or scrap steel which may be remanufactured by being subjected to heat and then rolled or hammered to the form desired is not scrap within the meaning of the new paragraph. On this question the *Iron Age* comments as follows:

INTENT OF THE LAW

It may have been the intention of the framers of the new act to provide a separate duty for scrap imported for rolling or hammering into a new product after passing through a heating or busheling furnace. But the fact remains that such material cannot come in as scrap. Customs officials at Washington, while not willing to make any ruling in the absence of a definite issue, intimate that in the case of any lot of scrap brought in for remanufacture without melting, duty would be imposed under one of the various classifications in the metal schedule apart from paragraph 118. In the iron trade one view taken since the question came up for discussion is that resort must be had to the "dragnet paragraph," No. 480, providing that "there shall be levied, collected and paid on the importation of all raw or unmanufactured articles not enumerated or provided for in this section, a duty of 10 per centum *ad valorem*, and on all articles manufactured, in whole or in part, not provided for in this section, a duty of 20 per centum *ad valorem*."

POSSIBLE REGULATIONS

On the other hand, the Treasury Department may take the view regarding certain importations, heretofore classified as "scrap," that they must pay the same duty as that provided for new material in the same form. If rerolling rails, for example, or old locomotive tires bought to be rolled into shovel plate, should be assessed the same duty as for new rails or new tires, their importation under some conditions would be out of the question. In the case of old rails the duty would thus be $3.92, or 8 cents less than the old duty on scrap. Old tires, under such a ruling would be assessed 1¼c. a pound —an absolutely prohibitory duty.

As the matter stands, importers of scrap that is not intended to be melted in the foundry cupola or in the basic open-hearth furnace are entirely at sea as to the amount they must pay to get the material into the country, and naturally will be wary of trading with foreign sellers. And even in the case of certain scrap brought in for remelting there is no assurance that the customs collector will decide that it is "fit only to be manufactured by melting." Since rulings are made only as cargoes come in, the importation of old material promises for some time to partake of the uncertainties of a lottery.

The Pacific Smelting and Mining Company

The consolidation of the Douglas Copper Company and the Mexican Exploration & Mining Company and their allied interests in Sonora, Mexico, promises to bring renewed and increased activity to the important southern Sonora mining region. The first company owned the El Cobre copper-gold-silver mines and the smeltery at Fundicion, 20 miles from El Cobre on the railroad, and the other company had extensive government exploration concessions, under which it had already partly developed several mines. The Anita mine of the El Cobre group is opened up to 900 ft. and in all about 2000 ft. of development has been done. It has blocked out a fair tonnage of silicious gold-silver-copper ore. The smeltery, designed for 1000 tons daily capacity, has a 350-ton unit now completed. It was built by a subsidiary company, owned by the Douglas Copper Company, under a government concession which gave the company the equivalent of about 4½ per cent. on the gross output. The company also owned a railroad concession, timber rights and a lime-flux deposit carrying $1 in gold and silver.

The Exploration company had mining concessions to 1,500,000 acres on the west side of the Yaqui river, north of Cumripa. Numerous locations have been made on this land by the company, in all more than 50, and several of them have been satisfactorily developed. The company also had interests in other mining companies, developing within the concessions. The mines of the Exploration company are expected to supply sufficient base ore to permit of the economic treatment at the Fundicion plant of the silicious ores of El Cobre mines. The Cananea, Yaqui River & Pacific railroad is now built along the east side of the Exploration company's concession. The smeltery is on the south extension of the road from the Yaqui river.

The new company has a capital of $6,000,000 common, and $2,000,000 7 per cent. cumulative preferred stock. There is in the treasury of the company $1,500,000 of the common and $600,000 of the preferred stock. Theodore Douglas, who was largely interested in both of the original companies, is president of the new company.

Details of Practical Mining

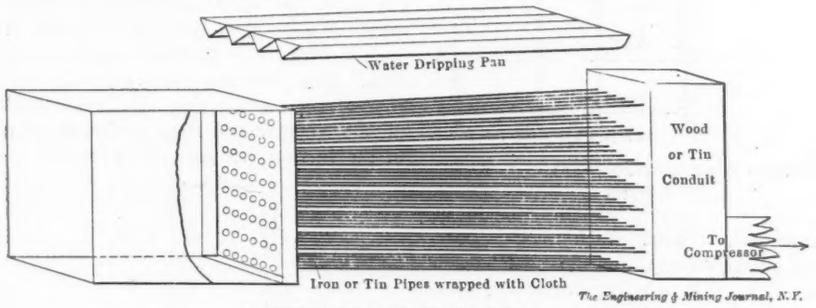
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Compressor Precooler

Compressor efficiency can be materially increased in warm weather by a simple and inexpensive precooler. It should be emphasized in the beginning that water or moist air should have no chance to mix with the compressor suction. The accompanying drawing shows how the cooling


Water Dripping Pan
Wood or Tin Conduit
To Compressor
Iron or Tin Pipes wrapped with Cloth
The Engineering & Mining Journal, N.Y.

PRECOOLER FOR AIR COMPRESSORS

nest of tubes should be connected by wood or light iron conduit to the suction valves of the compressor. The nest of pipes can be made up of odd sizes of iron, or even tin or galvanized-iron speaking tubes can be used. If water is worth saving it can be pumped back at slight expense, though the flow should be regulated to just the quantity required to keep the pipes wet. These should be wrapped with thin cloth and should be placed in the open, preferably where prevailing winds or drafts will cause a maximum evaporation.

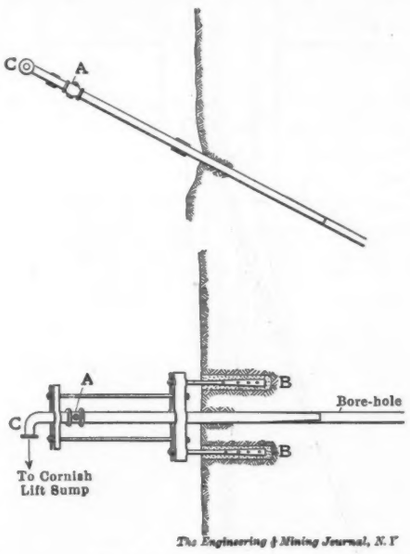
As an extreme example of the efficiency of this arrangement, the following may be stated: The difference between the temperatures of wet and dry thermometers at a large plant in California in summer has reached 40 deg., the difference between 110 and 70 deg. This difference in the temperature of compressor intake amounts to over 8 per cent. The arrangement shown in the sketch precludes the saturation of the air with water, as recently complained of in South Africa, where precooling by spraying water directly into the intake was attempted. In fact, if the temperature of the water supply is below the dew point, and an abundance is available, water will actually be condensed out of the air as drawn to the compressor and can be drawn off from the bottom of the cool-air conduit.

Stopping the Flow of Water from a Drill Hole

Several years ago a bore-hole in the Great Fingall mine, Western Australia, was put out in an easterly direction from the No. 7 plat of the Armstrong shaft; depth of level from surface was 536 ft.; inclination of bore-hole, 27 deg. from the horizontal; total depth of bore hole, 747 ft. At a depth of approximately 500 ft. a flow of salt water was encountered, which produced 6000 gal. per hour. When drilling operations were concluded it was decided to control the flow of water, and the following method described by G. C. Klug in the *Journal* of the Western Australia Chamber of Mines, was employed:

A piece of 1½-in. steam pipe 5 ft. long was tapered for half its length from its full diameter at the middle to 1 1/16-in. at the end, the metal at this point being 1/32 in. thick; the other end of the pipe was threaded to receive a 1½-in. plug-cock. The tapered end was forced into the bore-hole and held in position by means of clamps and bolts which had previously been cemented into holes drilled into the surrounding rock as shown at *B* in the accompanying sketch. This proved effectual in sealing the bore-hole itself, but when the water was shut off, leakage of water took place through fissures in the surrounding country. Owing to the gradual increase of water finding its way into the lower levels, it was found necessary to "take up" as much water as possible in the upper levels; and in order to assist matters in this direction, the plugging of the bore-hole was decided upon.

A double-ram Cameron pump having cylinders 7-in. diam., rams 4-in. diam. and 6-in. stroke, was erected close to the bore-hole, and the delivery pipe was connected up to the 1½-in. pipe at *C*. An ordinary cyanide case was used for a suction sump, and into this a water pipe was led. Compressed air at a pressure of 80 lb. per sq. in. was used to drive the pump. The suction sump was filled with water, the plug-



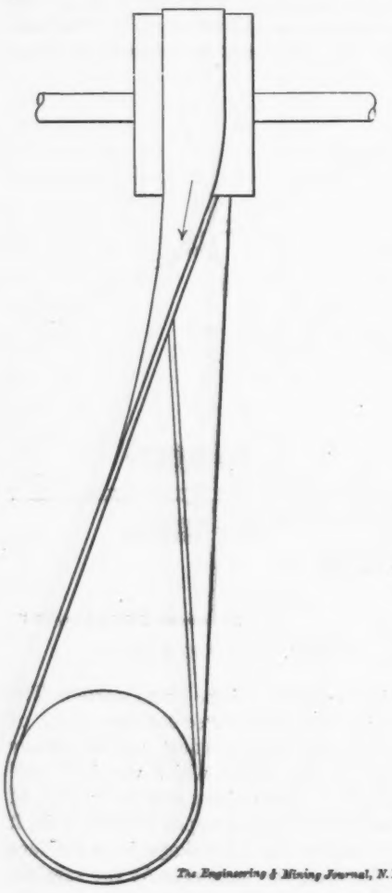
DRILL HOLE AND FITTINGS

cock *A* opened, and the pump started. The sump was kept three-quarters full of water, and pine sawdust was gradually added to the water, which was kept well agitated. When about one cubic foot of sawdust had been pumped into the hole, it was noticed that all leakage from the face of the rock had stopped. As the sawdust was intended only to temporarily stop the larger cracks, the pump was stopped, the sawdust removed from the sump and clean water pumped for a few minutes into the hole. Portland cement was now added to the sump in such quantities as to form approximately a mixture of 25 per cent. cement and 75 per cent. water, and this was pumped into the bore-hole in the same manner as the sawdust, cement being added as required. At first, the pump worked quite freely against the pressure encountered; but as the hole filled with cement, the pressure gradually increased until it was necessary to assist the pump by barring the fly wheel round. When one cask of cement had been used it was found impossible to force any more into the hole.

The cock *A* was then closed and after standing four days, it was opened, when it was found that the water had been completely stopped, and there is now no leakage whatever through the surrounding country.

Quarter-turn Belts

Quarter-turn belts are often a source of much annoyance, trouble and delay. This, when caused by the unequal stretching of belt edges, can be neatly and permanently avoided by putting a half turn in the belt

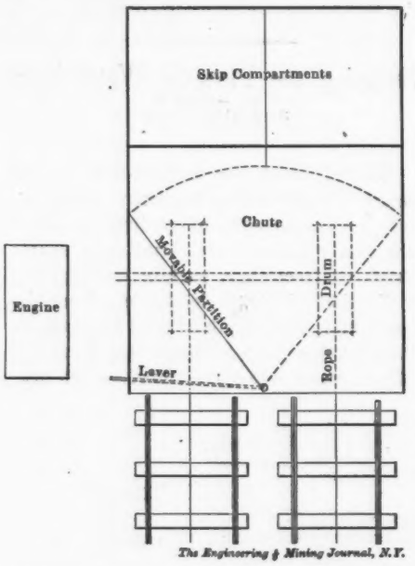


QUARTER TURN BELT LACED WITH HALF TWIST

before lacing it, as shown in the sketch. When run this way both sides of the belts are alternately on the pulleys and both edges alternately take the stretch of the quarter turn. Theoretically, the hair side of a leather belt alone should touch the pulley, but the extra strain of the quarter turn, especially with wide belts, large pulleys or short centers, warrants this departure from standard practice. With rubber belts the advantage of this half turn is particularly noticeable and the life of the belt is prolonged while that of the operator is made more pleasant.

Movable Partition for an Ore Chute

The accompanying illustration shows, in plan, a movable partition, 2½x6 ft., made of ½-in. sheet steel, reinforced with angle iron. It is pivoted at the lower end with a vertical axis extending below the chute to which a lever is attached to shift the partition. It is used in the double chute from the skip so that ore from both skips may be delivered into one car without changing the position of the car. Tail-rope haulage, with two reversible side-



LOADING ARRANGEMENT AT THE PEWABIC MINE

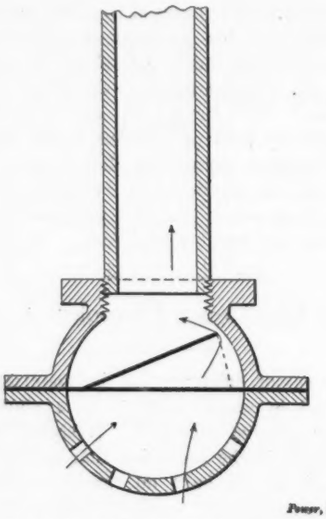
dump cars, is used. Each track is operated independently, and no switching is necessary. The winding drums are operated on one shaft by friction clutches.

Keeping Miners' Time

In mines where the system of time keeping by having the employees carry numbered tags during working hours is employed, an additional check upon the time is afforded with practically no more trouble, by having the men deposit these checks again at the level stations. The men take their checks from the file board in the office on coming into the shaft house, and upon reaching the level stations from which they go to work, hang them upon the proper nail on a small file board. Upon going off shift they again take their tag depositing it, upon reaching the surface, in a box placed for the purpose in the office. By this means, the mine boss can check the time as shown on his own record by simply referring to the file board at the level stations, and this, together with the record kept by the sub-boss, gives three checks upon each man's time.

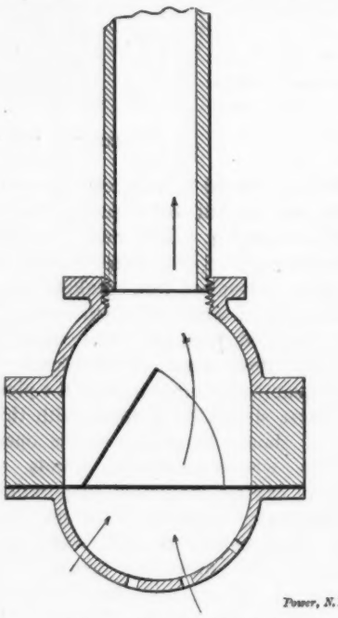
Effect on Economy of a Poorly Constructed Foot Valve

The ordinary foot valve consists of an upper half tapped to receive the suction pipe, a lower half with apertures to admit water, and between them a leather gasket, part of which forms a flap, as shown by



FOOT VALVE SHOWING OPENING THROTTLED

the heavy line in the accompanying drawings. A method of correcting a defect in such a valve is described in *Power*, Nov. 2, 1909. This valve was screwed to the bottom of the suction pipe of a centrifugal pump; when in operation a vacuum gage in the suction line showed 20 in. of vac-



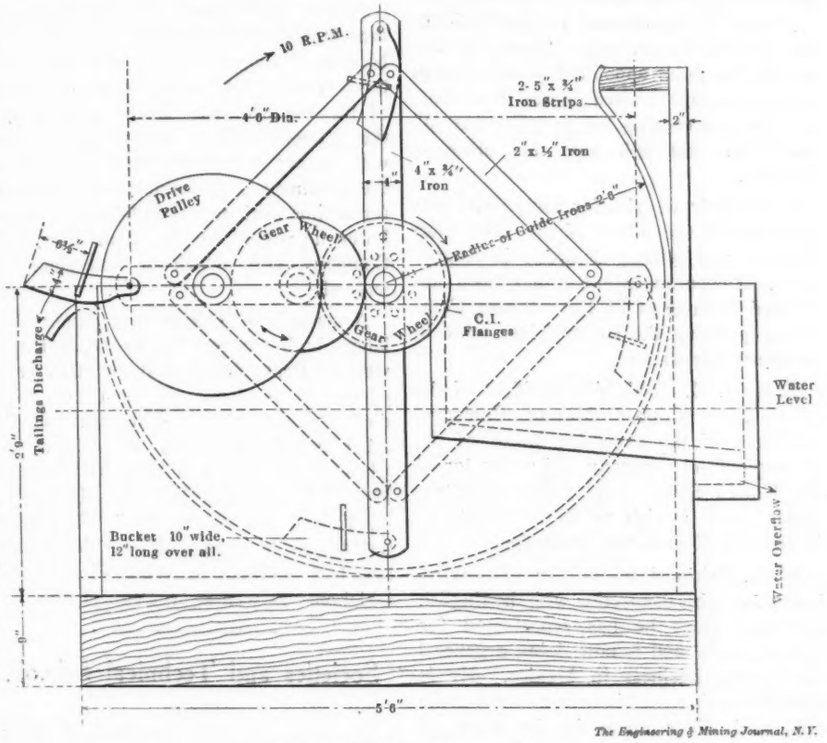
FOOT VALVE WITH CASTING BETWEEN THE HALVES

uum, which was too high, considering that the length of suction pipe was only 6 ft. It was thought the apertures admitting water were throttling the flow and the lower half of the foot valve was left off, but there was no improvement.

On further examination it was found that the flap, when open, rested its edge on the surface of the valve and practically shut off the flow. This was corrected by fitting a casting between the two halves, allowing plenty of room for the flap to open. The vacuum gage then showed only about 2 or 3 inches.

Dewaterer for Jig Tailings

The dewatering device shown in the accompanying illustration is adapted from the type sometimes used to handle the product from log washers. It was formerly used, in the mill of the Bertha Mineral Company, at Austinville, Va., to handle the tails from a Hancock jig and gave good results when operated with fairly coarse material; a large proportion of slimes or mud caused too great a consumption of power. The details of construction are shown in the drawing. The dewaterer is fed from the side, the material being scooped up as the frame turns and delivered over the discharge lip. The buckets being made of perforated metal allows the material to drain as it is elevated. Run at 10 r.p.m. the apparatus has a capacity of about four tons per hour.

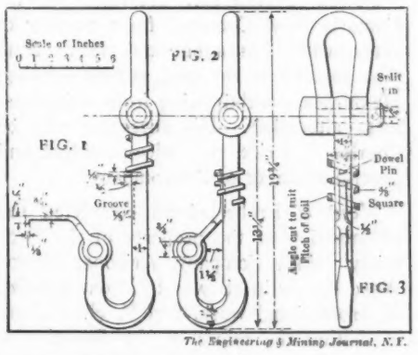


DEWATERER FOR JIG TAILINGS

Safety-hook for Sinking

A safety hook devised for use in connection with shaft-sinking operations at the Chaffers gold mine was recently described by J. Boyd Aarons in the *Queens. Gov. Min. Journ.* This hook is used in the sinking of the new shaft, and is designed to facilitate the speedy exchange of the empty for the full bucket and providing, at the same time, a safe means of attaching the bucket to the winding rope.

The three figures illustrate the construction of the hook. Fig. 1 shows the hook open in position for detaching the bucket; Fig. 2 shows the hook closed; Fig. 3 is a front view of the hook showing in section the closing device, which consists of a helical coil engaging a dowel pin and closing over the pivoted portion of the hook.



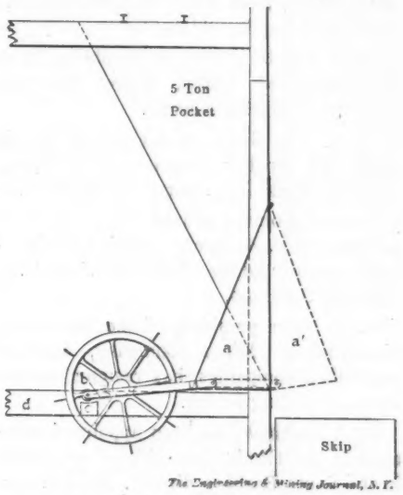
SAFETY-HOOK FOR SHAFT SINKING

The hook and coil are made of steel, and while hot the coil is shaped round the hook. The dowel pin is riveted into the hook, but it would be better if the pin were part of the forging. The ends of the pin, on which the pivoted portion of the hook turns, are riveted. The total weight of the bucket used on this hook, when filled with rock, is approximately 800 pounds.

Loading Device for Skips

A pocket that holds one skipload, 5 tons, is made of sheet iron, and built in the side of the shaft as shown in the accompanying illustration. The pocket is the width of the skip and over the front is a hood which is held in place by a hinge at the top and a bar connected with a wheel at the bottom. This hood forms about ½ of the front of the pocket and by revolving the wheel it can be opened to the position indicated by *a'*.

The wheel is 3 ft. in diameter and is provided with handles the same as a steering wheel. When the hood is closed, the crank-shaft pin is a little off center and it is impossible for the ore to open the hood. As the wheel is revolved the connecting bar *b* is raised above the center, and the weight of the ore forces the hood open. As soon as the ore is all out, the weight of the hood is sufficient to close itself by gravity. A lug *c*, on a second beam parallel to *d*, acts as a bumper for the bar *b* to close against. The beam *d* supports the wheel and axle. The time required for loading a 5-ton skip is 3 seconds. The axle of the wheel extends the width of the hood and has a crank on the opposite end, also connected with the hood so that both sides of the hood are securely held in place.



LOADING DEVICE FOR SKIPS, CHAPIN MINE

Cyanide Tanks

All tanks in a cyanide plant, except those to contain solution returned from precipitation sumps, should be provided with bottom discharge doors of generous dimensions when built. Sooner or later it will be necessary to clean out such tanks. With slime settlers, agitation tanks, battery and supply tanks, nothing is so convenient as bottom discharges, nor so expensive as raising slime over the edge of the tank.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Etienne A. Ritter, of Denver, Colo., is examining mines near Sumpter, Oregon.

H. G. Douglass, for 25 years engaged in mining in California, has gone to Honduras.

Hennen Jennings has returned to his home, 2221 Massachusetts avenue, Washington.

Victor Rakowsky has returned to Duluth, Minn., from a two months' examination of claims in Oklahoma.

Reiji Kanda, professor of mining in the University of Tokyo, Japan, has been visiting Goldfield, Nevada.

P. E. Van Saun, chief engineer for the Mill and Smelter Engineering Company, of New York, has returned from Nevada.

A correspondent would like to have the address of P. A. Sperry, mining engineer, until recently editor of *Mining Science*, of Denver, Colorado.

E. B. Gage, president of the Tombstone Consolidated Mines Company, Limited, and allied companies, has resigned on account of failing health.

Fred Matthew has been appointed manager of the Hinds Consolidated properties in the Santa Barbara district, Mexico, succeeding O. E. Slinack.

George D. Blood announces that he has resumed general practice in mining engineering, with office at 307 Herald building, Salt Lake City, Utah.

E. P. Merrill has resigned as director of the Real del Monte y Pachuca Company at Pachuca, Mexico, and C. W. Van Law has been appointed to succeed him.

Arthur Winslow, of Boston, was in Goldfield., Nev., several days recently inspecting the workings of the Consolidated mine, in which he is interested.

C. A. Overstrom, professor of mining at the Utah State University, has severed his connection with that institution for the purpose of reëntering the mining field.

John Edward Clennell passed through New York this week. He is on his way to Mexico to take charge of the cyanide works at the Minas Prietas in Sonora.

Thomas P. Schwanger, recently with the Carpenter Steel Works at Reading, Penn., has been appointed superintendent of the Cardenas Iron Works at Cardenas, Cuba.

H. M. German, recently superintendent of the Rivers Mining and Manufacturing Company, has been appointed instructor in metallurgy in the South Dakota School of Mines at Rapid City.

James I. Long has resigned his position as general manager of the Parral & Durango railroad in Mexico, in order to devote his time to the Palmilla Mining Company as president.

Lieut.-Col. John Carson, president Crown-Reserve Mining Company, and Samuel W. Cohen, general manager of the company, have been in New York on business for the company.

John G. Flynn, formerly of Goldfield, Nev., has been appointed superintendent of the mines of the Santa Cruz Mining and Milling Company, operating about 60 miles from Mazatlan, Sinaloa, Mexico.

A. H. Reed has resigned as engineer with the Independent Phosphate Company, Columbia, Tenn., to accept the position of local manager of the Rosiclare Fluorspar and Lead mines, Rosiclare, Illinois.

Charles C. Linthicum, professor of patent law in Northwestern University law school, has been appointed general patent counsel for the United States Steel Corporation, succeeding the late Thomas W. Bakewell. He will have his office in Chicago.

L. R. Budrow, who for some years was manager of the mines of the Michoacan Railway and Mining Company in Angangueo, Michoacan, Mexico, has been appointed manager of El Tigre Mining Company, operating the Lucky Tiger mine in northern Sonora.

Judge J. H. Reed, vice-president of the East Butte Copper Mining Company, chairman of the executive board of the Carnegie Steel Company and a director of the United States Steel Corporation, recently made a visit to Butte, Mont., to inspect the East Butte properties.

W. A. Prichard, of the City of Mexico, has severed his connection with the English company which he has represented for several years, and is now doing a general engineering business in Mexico. He is also developing on his own account some gold and silver mines in the State of Sinaloa.

Powell Stackhouse, president of the Cambria Steel Company for a number of years, will, it is announced, retire from that position at the next annual meeting. He purposes withdrawing from active business altogether. His successor will be Charles S. Price, now vice-president and general manager of the company.

Weed & Probert have completed the examination of the property of the Propriety Mines Company, Arizona. Doctor Weed is now in his way to Phœnix, Ariz., on professional work, and F. H. Probert is visiting the mines of the Superior & Boston Copper Company, at Globe, Ariz., of which he is consulting engineer.

J. R. Finlay, of New York, well known as a consulting mining engineer, who has previously been in charge of large mining operations in Idaho, Colorado and Missouri, has been appointed general manager of the Goldfield Consolidated, succeeding J. H. Mackenzie, who retires because of the demands of his private interests. Mr. Mackenzie will, however, continue to act as consulting engineer for the Goldfield Consolidated and will remain on its board of directors.

Obituary

Thomas J. Morgan died at Wellston, O., Nov. 13, aged 62 years. He was an extensive coal operator in the Jackson county field, and owned several mines.

Eli Emory Hendrick, president of the Hendrick Manufacturing Company, died at Carbondale, Penn., Oct. 25. He was widely known and respected.

Albert W. Young, of Cleveland, O., died at Detroit, Mich., Nov. 17. He was born at Youngstown, O., and early entered the coal industry. He was an officer of the Sheppler Gas Coal Company and the Youghiogheny Coal Company, and when those companies were merged in the Pittsburg Coal Company, he remained for a time with the consolidated concern. Later he organized the Glens Run Coal Company, with which he had since remained.

Armstead B. Baxter and James Callahan, both pioneers in the oil region of western Pennsylvania and for many years partners and large oil operators, both died Oct. 21, one at Pittsburg and the other at Oakdale, Penn. Mr. Baxter was 58 years old and was born in Pittsburg. Mr. Callahan was born in Rochester, N. Y., and was 50 years old. Both were well known to oil men all over the country and had operated in West Virginia and Oklahoma as well as in Pennsylvania.

Societies and Technical Schools.

American Institute of Chemical Engineers—A program has been issued for the annual meeting, to be held in Philadelphia, the Hotel Walton being headquarters. On Dec. 8 there will be a business meeting and two sessions for reading of papers, besides a visit to the University of Pennsylvania. On Dec. 9 the day will be taken up by visits to a number of important plants in Philadelphia and vicinity. The annual dinner will be held in the evening. On Dec. 10 there will be a final business meeting and two sessions for papers and discussion, besides a visit to the Trenton potteries. The papers promised for the meeting, besides the address of Prof. Charles E. Munroe, the president, on "The Chemical Industries of America," include a number on various topics, among which are: "Natural Draft Gas Producers and Gas Furnaces," by Ernest Schmatolla; "Manufacture of Carbon Bisulphides," by Edward R. Taylor; "Chemical Composition of Illinois Coal," and "Heat Efficiency of Smokeless Combustion and Heat Absorbing Capacity of Boilers," by A. Bement.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 20—The quartz mines of Amador county are doing well. The Bunker Hill is paying regular dividends and each stamp of the mill is turning out about $1400 per month. The Kennedy is in good ore, notwithstanding its great depth, and the Argonaut is also doing well. The Fremont Consolidated is on a paying basis and has completed its repairs and paid for all the damages from the fire in the shaft. The Amador Gold Mining Company will increase the mill on the Bay State. The old Wildman and Mahoney mines will soon resume and the Keystone will be sunk deeper.

The Spring Valley mine at Cherokee, Butte county, at one time a large producer by the hydraulic method, will soon be started up as a drift mine. The Cherokee Gold Gravel Company has been organized by L. L. Green, E. C. Wilson, A. M. Wilson, W. M. Taylor, all of Oroville, and M. J. Green, of San Francisco. The gravel channel lies under Table mountain. At this mine the largest diamonds found in California were discovered.

W. S. Kendall, of Folsom, Sacramento county, has brought suit against the El Dorado Gold Dredging company to terminate a lease held by the company on his land near Fair Oaks. He claims that they did not continue to carry on mining operations steadily as agreed. The El Dorado Company failed to make any money with its dredge and finally sold out to the Natomas Consolidated, which now owns the dredge and the lease on the ground.

A company has been formed in Chicago to take over the Champion Mining Company property at Nevada City. George F. Fitzgerald is manager of the new company. Work is to be carried on through a new central shaft. On the different properties there are 140 stamps. The old company has done nothing for some years as it did not have the capital.

The Bald Mountain Extension drift mine at Forest, once a large producer, has been placed under bond to O. A. Harlan, of Alleghany. Plans are made for the development of the mine. There is a long bedrock tunnel and from this upraises will be made to tap the known channel. A large area is still virgin.

Denver

Nov. 20—In spite of the stormy weather which has visited the East Argentine district during the past few days, tieing up the Argentine Central railway, thus making shipments impossible, the various lessees on the properties of the Waldorf company, continued operations with their usual activity, 30 men being at work in the Tobin tunnel alone. It is stated that there are 2000 tons at this working, awaiting the reopening of the railway.

Arrangements have been affected for the sinking of the Topeka shaft, in Russell district, Gilpin county, an additional 100 ft., making the total depth, when this new work is completed, 1038 ft. The bottom levels have been cleaned out, new underground equipment installed, and development of the lower workings is to be prosecuted vigorously.

It is reported by the manager of the Lamartine mine, near Idaho Springs, that the various lessees on this property have now about 20 men employed, the operations being confined to the tunnel level. The concentrator which has been at work —successfully, it is claimed—on the dump ores, has been closed for the winter.

Regular shipments are being made from the Gold Dirt mine at Empire, the average yield of the ore being said to be from 5 to 6 oz. gold per ton.

A strike is reported as having been made in the main tunnel of the Golden Sun mine, on South Boulder creek, about two miles above Rollinsville, in the northern end of Gilpin county, the ore being zinc-lead. This company has been at work for about three years driving a long crosscut tunnel to intersect the veins at depth.

It is stated by officials of the Denver, Laramie & Northwestern railway, now under construction between Denver and Greeley, that if weather conditions continue favorable, this new railroad will be in operation to the latter place in about a month.

The Commercial Coal and Coke Company, organized two years ago, and operating in a small way at Strong, Huerfano county, has secured additional working capital, and will soon commence construction of 200 coke ovens and a new washery at Sopris. F. D. Heath, of Denver, is vice-president.

Butte

Nov. 21—At the meeting of the stockholders of the North Butte Extension Development Company, the following were elected directors: C. S. Goldsboro, John Detjean, Curtis Wiggs, John L. Lockwood, D. S. Harding, David Angus, E. L. Thatcher. Dudley A. Tyng & Co., who made a fight to secure control of the board, were defeated. As a result of this election the company's treasury will recover in the neighborhood of 100,000 shares of stock. These shares are alleged to have been appropriated by former directors, and these former directors have now offered to return the stock to the company.

The East Butte company has decided not to operate the new pump on the 900-ft. level as the price of copper does not justify the expense. The company is working the Parrot slag dump. At the Pittsmont mine, of the company, the operations are mainly on the 800-ft. level, though work is being done on the 1000- and 1200-ft. levels. From the 800-ft. to the 600-ft. levels, a raise has been run in ore averaging 4 per cent. copper. In addition to the company's ore the Pittsmont smeltery is treating 55 tons daily from the Sarsfield mine and ore from the Snowstorm in Idaho.

Salt Lake City

Nov. 21—The first train from San Francisco over the Western Pacific arrived here Nov. 10. Regular freight traffic will begin Dec. 1. The Nevada Northern from Ely, which crosses the Western Pacific at Shafter, has announced a new rate of $3 on ore not to exceed $25 per ton from East Ely, McGill and Cherry Creek to Salt Lake. It is predicted and expected that this new railroad will immediately revive shipping from several properties in the Ely and Duck Creek districts. The Cherry Creek section has just resumed operation with a 100-ton mill, producing a lead and a lead-zinc concentrate for which Salt Lake is the natural market.

The Ely Amalgamated Copper Company has been incorporated by Salt Lake interests to operate claims near the Steptoe smeltery, McGill, Nevada.

The Cole-Ryan interests are reported to be completing arrangements for opening offices at Salt Lake as the western center of their activities. They are reported to have made overtures to both the Ohio Copper and the Boston Consolidated companies for their outputs and are making a very determined effort to get a foothold in Bingham.

The Garfield smeltery is receiving a shipment of high-grade copper ores from the operations at the new copper camp of Contact, Nev. A large tonnage of fluxing ore is also being mined by the American Smelting and Refining Company at Eureka, Nev., which is also being shipped to Garfield.

The United States Smelting, Refining

and Mining Company is reported to have made a contract for the total output of the Valley View group at Bannock, Nev. The treatment charge is $5 per ton, the freight rate is $4.50. In addition there is the hauling charge of $5 from Bannock to Battle Mountain on the Southern Pacific.

Indianapolis

Nov. 22—The mine disaster in Illinois has aroused the Indiana authorities. W. S. Blatchley, State geologist and head of the mining-regulation department, says there are 50 mines in Indiana where a similar catastrophe might be reasonably expected to occur at any time. In order to reduce the danger, Mr. Blatchley will at once take up with James Epperson, chief mine inspector, a plan for compelling the mine owners to remedy dangerous features. Mr. Blatchley said, as he understood conditions, the death and injury of the Cherry mine men is due to the fact that their only means of exit from the mine was shut off by the flames, at the foot of the shaft. In this mine, as in most of the mines in Indiana, there are two means of exit, the main shaft and the air shaft, a short distance away. The fault lay in the fact that the main shaft and the air shaft were too close together.

Mr. Blatchley said similar conditions exist in nearly all the big mines in this State. The average distance of the air shaft from the main shaft is less than 300 ft. A fire at the base of the main shaft in any of these mines would prevent the men reaching the air shaft, and with the means of egress shut off, they would be caught in a trap with a fire on one side and a blind wall of coal on the other. Escape would be hopeless unless the fire could be extinguished before the mine became filled with smoke and deadly gas.

Mr. Blatchley said he had long advocated a plural system of mine exits and that he would now see what can be done toward compelling the mine owners to supply them. "If it cannot be done under the present laws, I will go before the next legislature and seek to have a law enacted by which it can be done. My general plan is that the mines should be equipped with a main shaft and an air shaft, as now, and that in addition, the entries, or passageways leading to the working rooms, should be equipped with exits at distances not to exceed a quarter of a mile. In the mines of the State, these entries often run for more than a mile from the main shaft, almost always in two directions, and frequently in four. I would have all the main entries equipped with these exits."

Mr. Blatchley said he expected "that the operators would fight him in this move; but if they can be brought to see that it should be made not only as a humane measure, but as an economic one as well, the task may be easier. Meanwhile it would be well to remember that Indiana is liable to duplicate the Illinois disaster any day."

Philip Penna, secretary of the Indiana Operators' Association, in commenting on the Illinois disaster said that the disaster was due to human negligence and as long as men are such as those who did not hurry the miners out of danger, the talk of the use of modern appliances for saving life in the mines is idle. Mr. Penna said that Indiana mines are not so dangerous as others and that if miners, bosses and superintendents comply with the rules and the laws there need be no sacrifice of life.

Nome, Alaska

Nov. 10—The excitement prevailing on the Seward peninsula over the recent gold strike on the Iditarod in the Innoko district will produce an activity over a large area for the winter months, greater than has stirred Alaska since the Klondike excitement. Nome miners have made preparations for the long trail journey from Norton sound to the Iditarod, and a rush equally great will be made from the Tanana and points about Seward. All districts not presenting favorable opportunities for winter mining work will send large representations into the interior. The Iditarod diggings were discovered by mere accident. Three prospectors traveling down the Yukon last May in a rickety makeshift craft, whose motive power was generated by an antique boiler, heard that the United States marine inspectors were on their trail. Knowing that their boat would not be able to stand inspection, as none of them was a licensed pilot or engineer, they turned up the little-explored Iditarod river to hide. A few days later they struck gold.

Nearly every good property in the Tanana camp hoists from two shafts instead of by the old method of one only. It is appreciated that the quicker the gold can be gotten out, the quicker it will be working for the owner, and the crews are at work continuously.

Operations in the Nome district for the summer were hindered to a very great extent on account of the lack of water. However, it is expected that next year will see a resumption of work on a better basis. The gold is there, and if the usual methods will not prove successful, dredges will be installed, which will admit of continued work even if the season should again prove to be a dry one.

The Stewart River Gold Dredging Company at Dawson, will install one of the largest dredges ever operated in Yukon placers, and expects to have it ready for next season. D. A. Matheson is superintendent. News of a new strike on Roden creek has been brought by this creek in six days. The diggings are shallow, not more than 12 to 15 ft. from the surface of bedrock.

Cobalt

Nov. 22—Crown Reserve has been the center of interest lately on account of the rapid drop in the stock, and many rumors concerning the condition of the mine were current. No shipments were made from that property for three weeks, but it is believed that the mine is in excellent physical condition, and shipments of high-grade ore have been resumed. It is undoubtedly true that production from the main Crown Reserve vein has been very heavy, but there are a number of smaller high-grade veins sufficient to keep up the output for some time to come. At present selling price of the stock the developed area of the Crown Reserve represents a value of $1,000,000 an acre.

An important deal was closed in the Lorrain district when a syndicate concluded the purchase of the Newman claim. This property is situated a short distance from the Wetlauffer mine, and one of the largest and best veins in this section was discovered there. It has been traced on the surface for 200 ft., and shows native silver. A company known as the Bellellen Silver Mines, Ltd., will be formed to develop the claim. The continuation of the high-grade ore in the veins of the Wetlauffer at depth has had a good deal of influence on this sale.

The annual report of the City of Cobalt company has just been issued and shows that during the past three months the production has been much greater as compared with the rest of the year. During the year the company shipped a total of 739 tons of ore, which returned 456,000 oz. of silver. It is interesting to note that the royalty paid to the Temiskaming & Northern Ontario Railway Commission was $69,772, and that $17,000 is still due.

One of the most important sales in the Gowganda district in this season was made a few days ago, when the Crawford property, which adjoins the Reeves-Dobie, was sold for $100,000. Uptodate little work has been done on the property, but there are several good surface showings of silver, and it is stated that some of the Reeves-Dobie veins run into it. For the last six months few deals in mining properties were made in this section, as after the big rush of last winter it was difficult to get anyone to invest money in the north.

Toronto

Nov. 20—The fourth sale of mining lands in the Gillies limit by tender was completed Nov. 16, resulting in the disposal of 37 out of the 55 lots advertised for the aggregate amount of $372,462, or an average price of $482 per acre. No bid of less than $2000 for a lot was accepted. The prices were higher than those received at previous sales, the rich discoveries on the Waldman property having attracted buyers.

According to a report on the coalfields of Manitoba, Saskatchewan, Alberta and

eastern British Columbia by D. B. Dowling to the Geological Survey of Canada, the total coal resources of the area included are estimated as follows: Anthracite, 400,000,000; anthracite and semi-anthracite, 860,000,000; bituminous and some semi-anthracite, 43,070,000,000; coal (lower grade and lignitic coal), 21,000,000,000; lignite, 78,160,000,000; total 143,490,000,000 tons.

Sales in the new gold district of Porcupine lake are being made daily, the general price being around $1000 per claim. An important deal was negotiated lately when Herbert Fale sold four claims in Tisdale township to an eastern syndicate for $20,000. Options have also been taken on two other claims. The four claims are said to have a continuation of the Wilson vein, which the engineer sent up by the Ontario government to report on the district, claims to be the largest he has seen.

The reopening of the White Reserve mine in the Maple Mountain district has given a fresh impetus to work in this section. The White Reserve is a private corporation, and was closed down for a few months owing to internal trouble among the owners. Shortly before operations were suspended they shipped out eight tons of ore, which assayed over 5000 oz. to the ton. There are three high-grade surface showings on the property, on which a small amount of work has been done, but now operations will be actively carried on, and it is expected that they will be making regular shipments. Several other companies operating in this district have started work.

Mexico

Nov. 21—The new mining law is before the senate. Senator Cacho made a speech opposing several sections but was voted down. The bill will be voted on article by article and probably will be enacted.

In the Batopilas district, Chihuahua, work is being held pending the settlement in London of details whereby the Batopilas Mining Company may organize subsidiary companies to operate over 250 acres of mineral land. The new cyanide plant of this company at the Hacienda de San Miguel is operating satisfactorily. The Gold Mines Company, Tres Hermanos, Santa Cecilia and others of the Tres Hermanos group have been consolidated and a mill is being erected. A London organization will investigate La Abundancia group about 25 miles northeast of Batopilas. This district is now accessible by rail from Chihuahua via the Orient railroad. Chihuahua capital will explore the new field discovered near Carichic. Work has been temporarily suspended on La Gloria and Nueva Australia. The Batopilas company has just concluded a survey of the Batopilas river within its property lines, and the survey shows a fall of 1000 feet.

What appears to be the first effort on the part of the National Railways of Mexico to secure control of the Mexican Railway or force that line to accept a pooling agreement, occurred last week when the National lines issued a circular announcing a reduction of their passenger rate to Vera Cruz and return from 24.50 pesos to 5 pesos. The Mexican Railway, an English corporation, is the only competing line and as a result of this move the common stock immediately dropped one and one-half pounds on the English market. The continuation of the policy will undoubtedly have a depressing effect on English investments here in general.

The railroad policy in Mexico, while not antagonistic to the mining interests, has virtually that effect in many cases. Large low-grade lead and copper producers are worth more generally to the country than all the bonanza properties put together. The employment of native labor is on a large scale, the capital invested larger, the freight delivered to the railroads is heavily increased, and the custom smelters have fewer furnaces idle and a corresponding increase in labor force. There are several low-grade properties, particularly copper, and a large number of prospects with promise of developing into this class, which could be operated at a small margin of profit, or at least the attempt would be made, if the railroads in such cases would meet the miner with a reasonable concession, or make a ruling allowing a rebate on a fixed minimum tonnage under a fixed ton value on the metallic contents. For this reason the Guggenheims and other custom-smelting companies are indisposed to consider the acquisition of new holdings, and low-grade ores providing carriers for dry ores are, as a rule, a much more valuable asset to a custom-smelting company than to mining companies. The railroads have ever evinced a short-sighted policy in their attitude to the miner, and apart from the low prices of copper and lead in the market, is the greatest obstacle to the operation of low-grade properties near enough the railroads to avoid wagon or mule freighting. Now that the government is interested in the railroads, and such organizations as the Chamber of Mines and Instituto Mexicano de Minas y Metalurgia are taking up the broader economic factors of the mineral industry, it may be that this subject in due time will be properly presented to the railroad commission, and, indeed, the subject is already up as one of several to receive early investigation.

Not a little new American capital has been withheld from the country during the first half of the year on account of the political agitation; but it is worthy of note that not at any time during this period was there any stop in the steady stream of European capital Mexico bound. But a few weeks after the Guadalajara political troubles an English firm took 2,000,000 pesos of state paper, and another English house began negotiations for the La Blanca and Santa Gertrudis mines, of Pachuca, at 15,000,000 pesos.

The mines of La Portilla, Cardeneña, Pelones and San Ramon in Durango are all making regular shipments of first-class ore to the Monterey and Torreon smelting plants. As it is three days' ride over a hard mountain trail to Tepehuanes, the nearest railroad point, such ore has to be of good grade and will run at least 20 kg. silver and 300 grams gold per metric ton, occasional shipments running much better. The Llanitos Mines Company is now installing a hydroelectric plant and air drills and will do vigorous prospecting and development. The most important improvement in the district is the remodeling of the San Ramon mill. For several years this has been run as a dry-crushing, chloridizing, roasting mill, using both cyanide and "hypo" to extract the metal. Now it is being changed to a wet crushing and cyanide mill, with concentration on Wilfleys and canvas tables. Tests on large lots have shown a higher extraction can be obtained by this method with decreased costs. An air compressor has been installed and will be used for agitating slimes and for elevating slimes and solution. The mill will be running soon. The San Ramon company has a large amount of high-grade milling ore broken and waiting treatment, besides large ore reserves of this grade. The mill will also purchase custom ores, of which several thousand tons are available. Donald C. Scott, of Chicago, is manager of the San Ramon mine and mill, and Edmund Shaw, of El Paso, has charge of the remodeling of the plant, and will operate it when this work is done. The La Portilla company has been making tests for some time with a view of erecting a treatment plant and the Llanitos company will shortly build a mill.

Many gold placers have been discovered in the region of Miahuatlan 20 miles southeast of Ejutla, Oaxaca.

London

Nov. 16—The prospectus has been issued of a new mining company to work a number of copper and silver-lead mines in the valley of Fuencaliente, province of Ciudad Real, Spain. The name of the company is the Spanish Mines Consolidated and the capital offered for subscription is £35,000 in 7-per cent. first-mortgage debentures. The engineers of the company, J. W. Richmond Lee and W. F. Anderson, report that the mines can be worked on a very profitable basis. The vendor is a company called Spanish Mines, Ltd., which has acquired options to purchase the properties of the San Bartolome Silver Lead Mines, Ltd., of the La Corona Copper Mining Company and of the Manchegan Mines, Ltd., all of comparatively recent formation, as well as properties belonging to certain individuals. The new company is, therefore, one in which reconstruction and consolidation are prominent features.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

Valdez—Practically all of the real property of the Reynolds-Alaska Development Company with the exception of the mining claims and a large amount of the personal property has been sold by the United States marshal to satisfy the claims of the Valdez Bank and Mercantile Company.

Ketchikan—The Rush & Brown mine shipped 950 tons of copper-gold ore to Tacoma Nov. 4.

Arizona

Development Company of America—This company has purchased the Saddle Mountain properties at Christmas in Pinal and Gila counties, and will operate them under the form of a subsidiary company called the Gila Copper Sulphide Company. The Development company has also secured the control of the London-Arizona Copper Company, with properties adjoining the Saddle Mountain in Gila county. The negotiations were carried on by F. M. Murphy, president of the Development company, and Victor L. Mason, secretary. The Development company is interested in the project to build a railroad from the terminus of the railroad built by the Imperial Copper company, a subsidiary of the Development company, to some deep-water port in Mexico, on the Gulf of California.

GILA COUNTY

Arizona Commercial—The smeltery at Globe is turning out about 20 tons of matte daily. Sulphide ore is supplied from the Copper Bell mine. The development work is now on the sixth level. John E. Penberthy is in charge.

Superior & Boston—The McGaw shaft is now at the 600-ft. level and crosscutting to the Great Eastern orebody begun. Exploration work is being carried on in the Gardner shaft. William G. Rice is president.

Rambo—A rich silver strike has been made on this property, five miles from Globe. It is owned by Hinson Thomas, and formerly was a large producer.

GRAHAM COUNTY

Clifton-Morenci—A company organized at Houghton, Mich., Willard J. Smith, president, has acquired the property near Metcalf. Work will be done on the Keating vein, supposed to be a split of the Coronado vein of the Arizona Copper Company.

PINAL COUNTY

Newbury—The company is continuing development at Newton. An aërial tramway will be installed to connect with the railroad, four miles distant. W. V. Lander is manager.

YAVAPAI COUNTY

Consolidated Arizona Smelting Company—The treasurer has submitted a statement of Nov. 10, showing cash on hand, $385,800. The expenditures on development and new construction since reorganization amount to $180,981. It is stated that the property is in effective condition and that smelting operations will begin soon after Jan. 1 with full capacity.

Arkansas

Red Cloud—This mine at Dodd City is making 15 tons daily of concentrates in the mill, treating about 125 tons of ore.

California

KERN COUNTY

Ferris—J. B. Ferris has formed a syndicate to work his holdings in Caliente district. Machinery will be installed.

Pearl—The mine at Caliente has been placed under bond to W. H. McCarthy, of Los Angeles, and crushing machinery will be installed.

MARIPOSA COUNTY

Mountain King—This mine on the Merced river, above Bagby, continues to yield very high-grade ore.

MONTEREY COUNTY

Gilded Crown—The mine, discovered in Los Burros district by H. F. Melville, is being opened.

PLACER COUNTY

Crandall—The new owners of this mine at Ophir will commence work at once. There is a mill and hoist on the mine but other machinery will be added. F. B. Norton is superintendent.

Orpheum—This mine at Ophir has its new electrically driven mill in full operation.

Lewis Hill—At this mine, three miles east of Newcastle, the tunnel will be extended and an upraise made to tap the channel.

Crater—W. P. Hammon has bought this mine at Ophir and also the Fairview, Crater Hill Extension and adjoining properties. Grading has commenced on the site for a 10-stamp mill.

PLUMAS COUNTY

Langhorst—A strike has been made in this mine near Cromberg. The lode found in the tunnel is 8 ft. wide.

SHASTA COUNTY

Sisson—This company at Sisson has struck a body of sulphide ore while crosscutting in tunnel No. 3.

SIERRA COUNTY

Great Divide—The company is ground a rich strike of quartz has been made. Compressors and air drills have been installed.

Hunch—S. B. Gracier, of San Francisco, states that a lower tunnel will be started in this mine at Alleghany.

Indian Hill—At this mine eight miles from Camptonville, the large and smaller flumes have been completed.

Chipps—At this mine, Sierra City, Lawrence Holly, superintendent, 12 stamps are dropping.

Colorado-Yellow Jacket—This mine at Alleghany has been sold to C. C. Crary and J. C. Spencer.

SISKIYOU COUNTY

Schreck—This company will pump from the Klamath river to a reservoir for hydraulicking.

Black Oak—The mine at Soulsbyville has closed to make repairs. Ore is developed on the 300 and 700 levels. S. A. Knapp is in charge.

Confidence—From this mine at Confidence high-grade ore is being taken out.

Yrma—The run on the old dump is up to expectations. The tramway has been completed and sinking commenced.

Draper—This mine near Soulsbyville has installed an electric power plant auxiliary.

Czarina—E. D. Brigham is superintendent of this property at Etna Mills, in place of H. S. Severman, resigned. The new 10-stamp mill has been completed and many improvements are being made.

Oom Paul—This group at Oro Fino, owned by Jeff Carter, has been bonded.

TUOLUMNE COUNTY

Mack—At this mine, Big Oak flat, M. Jacobs, superintendent, additional stamps will be put in commission.

Moffitt—These river claims across the Tuolumne near Jacksonville are to be opened by a company. A dam will be built to turn the river and get at the "potholes."

Mack—The 20-stamp mill continues running on good ore, and drifting from the 600 level is still being carried on.

McTarnahan—At this mine on Mormon creek, under lease to Haslam and Buthenth, high-grade gravel has been struck.

Colorado

FREMONT COUNTY

Copperfield Consolidated—The company has 1000 acres in the Red Gulch mining district. The development work, amounting to 8000 ft., is mostly within 275 ft. of the surface. A 500-ton concentrator is planned. J. B. Conger, of Denver, is president.

GUNNISON COUNTY

Lead King—The property at Crystal is being opened up by J. W. Deane. The Black Queen is also operating.

LAKE COUNTY—LEADVILLE

A. Y. & Minnie—The railroad switch has been completed to the dumps and the lessees are shipping 50 tons daily of a fair grade of zinc ore.

International—Development work in the orebody at the 1250-ft. level is all that is being done at this property in the Ten Mile district for the present. Work is being rushed on the mill, which it is expected will be running by February. When the mill starts, the mine will be in a position to supply it with 150 tons daily.

PARK COUNTY

North Star—A company has been formed to drive the North Star tunnel to drain the mines of the Consolidated Montgomery district. J. H. Meyers, of Denver, is in charge.

SAN JUAN DISTRICT

The output of the Silverton district for October was 4975 tons, 2175 tons being crude ore, and the remainder concentrates, the heaviest production of crude ore coming from the Gold King, and that of concentrates from the Gold Tunnel (Highland Mary). This output will, it is expected, be doubled in November.

Mono-Baltic—The machinery for the smeltery in the Red Mountain district, is *en route* from Durango. This is to be a 250-ton plant.

Silver Ledge—The mill and tramway machinery was started last week on a trial run to effect the necessary adjustments before steady operations are begun.

Champion—This mine, on Sultan mountain, reports a strike of gold-silver-lead ore in a 4-ft. vein on which drifting has been carried on for several weeks.

TELLER COUNTY—CRIPPLE CREEK

The biggest lease ever granted on a producing mine in the Cripple Creek district was recently executed when the Isabella Gold Mining Company turned over to T. B. Burbridge, of Denver, and the Western Investment Company 65 acres of Isabella ground on Bull hill for two years, on a graded royalty. The lease covers the following properties: Empire State, Emmas 1 and 2, Comet, Tom Thumb, Sully, Snow Bird and Jack Rabbits Nos. 1 to 5.

El Paso—Over 150 miners are employed on the mine, on Beacon hill, by the company and its 45 sets of leasers. It is stated that two strikes of ore running $25 to $30 per ton have been made at the extreme north end of the company's territory, in an upraise from the third level of the El Paso shaft.

Golden Cycle—The mine, which has been closed for a month for repairs, has resumed operations at full capacity.

C. O. D.—This mine, in Poverty gulch, has reëntered the ranks of producers, lessees having recently made two shipments of ore of fair grade.

Portland—The carpenter shop and sawmill were destroyed by fire on Nov. 16, entailing a loss of $10,000, covered by insurance.

Pride of Cripple Creek—Material has been delivered for the new orehouse on Ironclad hill, and the work of construction will be pushed as speedily as possible. Manager Johnson is quoted as saying that the shoot encountered at the 500-ft. level is developing into one of the strongest and richest orebodies in that section of the district. The mine is being worked under lease.

Georgia

DOUGLAS COUNTY—VILLA RICA

Sulphur Mining and Railroad Company—Owing to the scarcity of labor during cotton-picking time the mine is being operated only on day shift. About 75 men are employed and daily shipments of about three cars of pyrites are being maintained. V. E. Hill is manager.

Idaho

IDAHO COUNTY

Plans have been completed for a 20-ton custom mill and sampling plant at Elk City. Cyanidation and stamps will be used. M. F. Tytter is in charge.

LEMHI COUNTY

Oriole—The company is developing the Mountain Boy claim in the Texas district. Hugh Ferguson is in charge.

SHOSHONE COUNTY

Silver-Lead—The company has purchased the stock of the Rex on Nine Mile. The compressor will be overhauled, a sinking pump installed and a contract given for sinking 500 ft. deeper.

Paragon Consolidated—On this property near Murray, the No. 5 Chicago tunnel, in 1400 ft., is being continued.

Black Horse—The mill will have an initial capacity of 100 tons daily, with rolls to handle 400 tons per day if the plant is enlarged.

Belmont—At a meeting of the stockholders, the par value of stock was increased from 10c. to $1 per share. The option on the claims given to a Spokane syndicate has been extended six months.

Snowstorm Extension—At a stockholders' meeting it was voted to turn over the entire property to a Los Angeles company.

Snowstorm—A contract with a California smeltery has been closed and shipments increased to about 6000 tons per month.

Monarch—The flume has been completed and operations at the mill resumed. An ore-sorting plant and ore bins are being constructed.

Illinois

Bates Brothers Coal Mine—This mine near Kewanee has been closed by a rush of water from a new drift. The water broke in suddenly and filled the mine before measures could be taken to handle it.

Gilchrist & Alden Coal Company—This company has just completed its new mine at Mather, on the Rock Island Southern road. The mine is equipped for an output of 1500 tons of coal per day.

Indiana

A deal has been closed whereby W. P. Easton and Virgil Roberts became the owners of the Bennie mine, one mile north of Linton. The transfer includes a number of acres of land under which the coal has been leased, and this land will be developed by the new owners.

For the first time in two years advertisements for miners and laborers are being posted in Clinton, and are appearing in the local papers. A new coal shaft is being sunk, another has just been completed and is ready to begin operations, and a gang of 100 men is busy laying track for switches to the new mines.

The committee appointed by the Indiana Operators' Association some time ago, to promote the movement for the establishment of an appliance station where oxygen, helmets, etc., may be kept, will meet in Terre Haute this week to take up the matter. The Illinois disaster has demonstrated the necessity for such a station.

Iowa

Avenue Top—Negotiations for the sale of this zinc mine at Dubuque are under way. The mine is being unwatered.

Kansas

There is a great scarcity of miners in the Galena district and several hundred could be put to work if they could be obtained.

Lockport—This company at Galena has unwatered the large leases down to the 100-ft. level and mining is active. South of the Memphis depot there has been developed a rich mine and also east of this. This tract has been under water for 10 years and the draining was only accomplished with centrifugal pumps.

Atchison Coal Mine—This mine, at Atchison, was sold Oct. 25, at receiver's sale, to S. R. Beebe, for $22,500. A new company will be formed and the mine reopened.

Michigan

COPPER

Superior—This mine will increase rock shipments to the Atlantic mill from 300 tons daily to 600 tons. Openings from No. 1 shaft continue in the same rich formation.

Oneca—The company has encountered a copper-bearing lode in No. 3 drill hole at 60 ft., believed to be the same as opened by the shaft sunk several years ago to a depth of 450 ft. The drill hole is 2000 ft. south of the shaft.

Gratiot—Before the end of the year, rock shipments will be made to the Calumet & Hecla mills.

Franklin—No. 1 Pewabic shaft is to the 27th level and a plat is being cut preparatory to crosscutting to the lode. Extension of the drifts from the 22d level are showing good ground. Three drifts have been extended into the Rhode Island tract with the same results. No. 3 shaft is sinking on the lode at 1200 feet.

Winona—The arrival of machinery for the stamp mill has facilitated the work. The portion of the concrete dam recently washed out can be repaired without causing any delay.

Calumet & Hecla—The last quarter of the large regrinding mill has gone into commission, making a total of 48 chilean mills and 196 Wilfley tables in service handling 1500 tons of sands daily. All conglomerate rock coming from the properties now controlled by this company will be stamped in its mills, and all rock from the Osceola and Kearsage amygdaloid lodes will be stamped in the Tamarack and Osceola mills.

Copper Range—The company will not take over the land in sections 7 and 8 which it has had under option from the St. Mary's Mineral Land Company. Much diamond drilling has been done on these lands, but results have not been made public.

La Salle—No. 1 shaft on the Caldwell tract is down 900 ft. and is coming into better rock. No. 2 Tecumseh shaft is down below the second level. As soon as the new addition to the Allouez-Centennial mill is ready, a mill test will be made.

Ojibway—Both shafts are down to the 1250-ft. level and sinking will be temporarily suspended and attention given to proving the lode.

IRON

Republic—The company will sink an additional shaft at Negaunee between the Cambria and Lillie mines.

Michigan Iron Mining Company—This new company of Iron River will operate in the Spring Valley district.

Armenia—This mine adjoining the MacDonald at Crystal Falls will resume. It belongs to the Corrigan-McKinney company.

Minnesota

A company represented by J. J. Rogers, of Lincoln, Neb., is exploring for iron on a 7000-acre tract in Cass, Todd and Morrison counties.

The development under way on the Mesabi range is greater than at any time in the history of the district. The Steel corporation is spending over $2,000,000 at Hibbing and Chisholm in stripping.

Missouri

Edwin M. White, of South Yarmouth, Mass., and C. C. Norton, of Boston, have purchased for $385,000 about 23,000 acres known as the American lead and baryta property, near Potosi.

Eastern Lead Company—The company's plant at Mine La Motte is closed and will remain so for some time. R. B. Magrath, Poughkeepsie, N. Y., is secretary.

JOPLIN ZINC-LEAD DISTRICT

Silver Star—The contract has been let to J. G. Marcum, of Joplin for a large mill on these mines of H. Gundling at Stotts City. The ground has been unwatered and the mines are running a central pumping plant.

Mary E.—The mine at Spring City has about been sold and a mill will be erected. It has developed one of the best prospects of the camp at a deeper level than the blanket formation.

Gibson—This mine which has had a fine record in the past has found good ore in the bottom.

Hamilton—This company of Joplin, A. J. Smith, manager has bought 160 acres south of the Herald mine at Cave Springs and is preparing to drill and develop.

C. C. Playter—A prospect drill is at work on the 160-acre tract south of Spring City.

Wollfsheart—The mill of this company, near Duenweg, is completed and the ground is ready to produce.

Montana

BUTTE DISTRICT

Butte-Balaklava—The first shipment of ore has been made. Raising the third compartment of the shaft from the 500-ft. level to the surface is progressing.

Bamar Copper—The shaft is down 175 ft., and sinking at the rate of 100 ft. per month.

Butte & Superior—The assay of ore taken from the 1600-ft. level gives 57.9 per cent. zinc, 25.2 oz. silver, 0.4 per cent. copper and 0.6 per cent. iron.

Silver Wave—W. D. Coburn, Walter Larens and J. E. Templeton are developing this group. At 150 ft. a 20-in. seam of galena has been uncovered. Stoping will begin soon. Shipments are being made to East Helena.

CARBON COUNTY

Butcher Creek Oil—Thomas Cruse has struck petroleum 15 miles west of Red Lodge.

JEFFERSON COUNTY

Montana-Corbin—The shaft has been unwatered, and when the new compressor has been installed sinking will be resumed.

Independence—The tunnel is in 200 ft., and more carbonate ore has been exposed.

Corbin Copper—Four cars of ore were shipped recently.

Calumet & Corbin—The company operating the Minnesota mine shipped its first car of ore to East Helena recently.

MISSOULA COUNTY

Iron Mask—At 700 ft. a strike has been made of 18 in. of shipping ore.

SANDERS COUNTY

Monitor—A tunnel nearly a mile long will be driven on the property to tap the ore at 2210 ft. The management expects to make 300 ft. per month. The ore is now hauled to Saltese, five miles distant. The tunnel will do away with this hauling.

Nevada

CHURCHILL COUNTY

Nevada Hills—A car of high-grade ore has just been shipped from this property at Fairview. Manager W. H. Webber expects to maintain shipments of like ore and the company is planning the erection of a mill, but the capacity and nature of the plant will be determined, when development has been further advanced.

Fairview-Eagles—A new ore house has been erected and steady shipments are being maintained. The shaft sinking is progressing steadily and as soon as the additional lift is completed crosscutting will be started toward the vein.

ESMERALDA COUNTY

Combination Fraction—All work upon this property has been temporarily shut down, and the mill is no longer being operated. The oreshoot, shortly after the payment of the dividend, began to grow smaller and the management of the mine decided to close for the present. H. S. Stark is manager.

Atlanta Mines—The shaft of the Garrison or Precious Metals lease at Goldfield has reached 650 ft. A promising quartz vein has been cut. It is the intention of the management to sink to 750 ft. before doing any lateral work, and none will be done at that level unless developments warrant. The company is prepared to sink 1000 ft. if necessary.

Nancy Donaldson—The easterly crosscut from the shaft at Goldfield is now entering the footwall of the vein, which gave such good returns on the surface. Surface work has proved the vein to be continuous for 1000 ft. John T. Hawkins is manager.

Jumbo Extension—The Goldfield Annex Company operating a lease upon this company's acreage at Goldfield has cut a well defined vein at 600 ft. It is the opinion of the manager that it is the extension of one of the veins cut in the Clermont shaft of the Consolidated company, on its eastward dip. The lease has two years to run from Nov. 1, 1909, and it is the intention to sink to 1000 ft. D. E. Lane, J. W. LaFoe and J. W. Dunphy have been granted a lease upon the Gold Coin claim of this company.

Florence-Goldfield—During the month of October the mill treated 4056 tons of an estimated value of $110,000. The tonnage treated was held back somewhat by the old crusher, which was badly worn; it has been replaced by a new gyratory of greater capacity and the ore treated per month will now increase. An excellent body of milling ore has been opened on the 480-ft. level of the Little Florence workings. Work is being extended in order to get into the block of ground formerly worked by the Reilly lease, as a large body of good ore is already blocked out in that portion of the mine. Work has been resumed upon the Gatzen lease, by the former lessees. Although it is against the policy of the company to grant new leases this one was again given to the old lessees on account of their already having spent so much money.

NYE COUNTY

The Tonopah production for the week ended Nov. 13, is 4877 tons having an estimated value of $121,925. The tonnage from the various mines being as follows: Tonopah, 3200; Montana-Tonopah, 927; McNamara, 550; West End, 200; total, 4877 tons.

Round Mountain—Bullion returns for October were $41,000, the largest in the history of the property. Two ore shoots have been discovered, one on the 600-ft. level having a width of 16 ft., and another upon the 700-ft. level entirely in virgin ground. These discoveries will double the known ore reserves.

Bonnie Clare—A. J. Trumbo, manager of the New Bonnie Clare Mining Company has closed contracts with the Nevada-California Power Company for a branch line. Machinery has been ordered to increase the capacity of the mill from fifty to one hundred tons per day, and it is expected to have it installed by Jan. 15, 1910. As soon as the improvements are made the company will accept custom ore in order to afford an outlet to the ores of the camp.

STOREY COUNTY

Crown Point—This Comstock company has announced that it will continue work on the 160, 300 and 1200 levels where good ore has been opened. Lower levels will be developed as the water permits.

WHITE PINE COUNTY

Nevada Consolidated—The company has announced that the date for the exchange of Cumberland-Ely stock in order to participate in the forthcoming dividend of the company is Dec. 1. The basis is 3¼ shares of Cumberland-Ely for one share of Nevada Consolidated.

Oklahoma

The Baxter camp is showing more signs of life than it has for over two years. Nearly all the mills are either running or preparing to run.

Mascotte—This mine at Quapaw will have a mill in the near future.

Big Jack—This mill at Quapaw has resumed after a long shutdown.

Oklah—This mine at Quapaw has developed one of the best prospects in the camp and has proved up its drilling with its shaft.

Peoria—E. E. Gordon, of Carthage, has reopened the old lead mines at Peoria and this camp will soon be producing.

Pennsylvania

ANTHRACITE COAL

Lehigh Coal and Navigation Company—The board has recommended that the stockholders renew the property-protective voting trust for five years from March 1 next, with $175 per share, instead of $135, as the minimum price at which stock put in trust may be sold. It was also agreed that Lewis A. Riley should be added to the number of trustees.

BITUMINOUS COAL

The county court of Washington county has confirmed an order made by the district mine inspectors directing the use of locked safety lamps in the Manifold mine of the Youghiogheny & Ohio Coal Company. The case is of importance as determining the power of the inspectors to make such orders.

South Dakota

The conflict between the Homestake management and the labor unions is becoming acute, and it is reputed that the mine may be closed. The company has brought a suit against the labor union for $10,000 damages, and posted anti-union notices.

Utah

BEAVER COUNTY

Revenue—A high-grade silver-lead ore is being sacked from the tunnel on the Cliff vein. The west drift from the cross-cut tunnel shows a full face of ore.

Red Warrior—On the 400-ft. level the ore has widened from 2 ft. to 6 ft. and carries lead and silver. The drift to the north has traversed 75 ft. of ore.

Harrington-Hickory—The station pump for 500 ft. is being installed. As soon as the shaft is sunk below this level ore shipments will be resumed.

Silver King—This group in the Mineral range has been acquired by Henry F. A. Riebling and associates, of Denver, and plans for development are being mapped.

BOX ELDER COUNTY

Homber—This company, operating near Brigham City, is shipping its first carload of graphite. It is said to be 96 to 98 per cent. pure and will be disposed of locally. T. J. Yates is manager.

JUAB COUNTY—TINTIC DISTRICT

Iron King—The work being carried on through the shaft has been discontinued to enable the tunnel, now in 1700 ft., to be driven faster to reach the main orebody, which it is expected to encounter in 800 to 1000 ft. The tunnel is finally to be driven to connect with the shaft, a distance of 5000 feet.

Opohongo—Shipments of two carloads per week are being maintained.

Utah Consolidated—The raise from the 300-ft. level has passed through white limestone similar to that encountered by the Uncle Sam before it reached the ore.

Iron Blossom—Drifting from the 1300-ft. level has disclosed indications of nearing the ore. Good ore is being mined on the 1100-ft. level. The shaft will be continued to 2000 feet.

Chief Consolidated—October shipments netted $7316. Regular shipments of 50 tons per day are being made.

SALT LAKE COUNTY—BINGHAM DISTRICT

North Utah—The double-compartment shaft is 175 ft. below the main tunnel. A station is being cut preparatory to drifting north and south to get under two ore-shoots already opened in the tunnel.

Utah Consolidated—The concrete foundations for the aërial tram from the mine in Carr Fork cañon to the International smeltery at Tooele, four miles distant, are completed and towers are being erected at the rate of five per day. The company is under contract to deliver 1000 tons of ore per day beginning April 1, 1910, but will fill the smeltery bins before that date. Eight hundred tons per day are now being shipped to Garfield.

SUMMIT COUNTY—PARK CITY DISTRICT

Daly-Judge—While driving on the 1200-ft. level, on a fissure parallel to the first one encountered on this level, a new streak of high-grade ore has been found which carries less zinc than the other ores of the mine. The three-mile tunnel from the Snake creek side of the range to the company workings will be started soon. The buildings at the tunnel mouth have been completed and the Knight power plant which is to furnish the power is nearly complete. Between two and three years is the estimated time for driving the total distance. Competitive bids for the work will be received.

WASHINGTON COUNTY

Reef—At the bottom of the old incline, which is down 400 ft., a shaft has been sunk and a rich streak of ore encountered. Henry Welte, Silver Reef, is the manager.

Vermont

Vermont Copper Company—A gas explosion recently occurred in the long brick flue between the blast furnace and the chimney on the hillside, blowing out a section of about 100 ft. Fortunately no one was hurt. The company at first endeavored to smelt pyritically, but is said to have been disappointed in the result, especially as to the amount of coke required. The furnace was then put on heap-roasted ore. It is said that everything was running smoothly when the explosion occurred.

Washington

FERRY COUNTY

Copper Key—Operations will be resumed in a short time, and carried on more extensively than before.

Oversight—A new body of ore has been found at 80 feet.

Paragon—John A. Wilson, of Spokane, and O. M. Matthews, of Northport, have obtained control of this property, and will begin development.

Bonanza—This property, abandoned for several years, is again making good, and regular shipments are being made. Frank J. Davy, Colville, has charge.

OKANOGAN COUNTY

Apex—The company is in the market for a power plant for the mine. James P. Blaine, Chesaw, is superintendent.

Wisconsin

ZINC-LEAD DISTRICT

The mill and roaster of the U. S. Zinc Corporation has been sold at court sale to the Baldwin interests, which will place it on a property near the Kennedy at Hazel Green.

Lyght—Eastern men represented by Julius Wilde, have purchased the mine at Platteville and resumed.

Red Jacket—The mine, at Centerville, has been released to B. W. Logan.

Dickson-Oettiker—The company is installing a small milling plant on the Dickson forty, east of the St. Rose.

Canada

BRITISH COLUMBIA

Northern Mines—The Copper Queen and Cornell mines, held under working option from the Van Anda company, are being operated by this company. Doctor Tanzier, Van Anda, manager.

Little Billy—A steam-power plant, boiler, hoisting engine, and four-drill compressor are being installed. James T. Taylor, Van Anda, is manager.

Malaspina—The tunnel is in 250 ft. Alfred Raper, Van Anda, is manager.

ONTARIO—COBALT

Shipments of ore from Cobalt for the week ended Nov. 13 were as follows: Crown Reserve, 61,720; Drummond, 390,000; Kerr Lake, 180,150; La Rose, 452,674; McKinley-Darragh, 46,700; Nipissing, 449,921; North Cobalt, 40,000; O'Brien, 64,053; Temiskaming, 60,000; Trethewey, 75,000; T. & H. B., 60,225; total, 1,880,443 pounds.

Hargrave—The No. 3 vein of the Kerr Lake mine, for which search has been made on the Hargrave property for a year, has been cut at the 375-ft. level.

Temiskaming—The stamp mill is completed and 30 stamps in place, and everything ready for the installation of the rest of the plant. The rock will be crushed to ¾-in. mesh and taken to the mill over an aërial tramway for 487 ft. to the mill, which stands on rising ground.

Cobalt Lake—A wide vein showing leaf silver has been struck in the crosscut 28 ft. north from the drift at the 190-ft. level near the McKinley boundary. The ore appears to be low grade.

Trinity-Cobalt—This property has been sold for $12,000.

Cobalt Lake—A 30-in. vein containing high-grade ore has been discovered on the 190-ft. level.

Argyle—This property is again to resume, having been closed down on account of litigation.

Mexico

CHIHUAHUA

The Chihuahua and Potosi mining companies have resumed shipments of zinc from the Santa Eulalia mines, as has the Calera company in western Chihuahua. The Lago zinc properties are also shipping calamine ore. All of these shipments are to the United States.

El Rayo—The results for October were: Ore crushed, 4500 tons; value of products shipped, $44,391; operating profit, 26,061. The extraction was 80 per cent.

Batopilas—The company's output for September was 42,688 oz. of silver. The output for eight months is 831,332 ounces.

COAHUILA

Torreon Smeltery—The copper converter is working satisfactorily treating 30 tons of matte daily, E. Harms, superintendent.

GUANAJUATO

Guanajuato Consolidated—The October crushing was 7384 tons and the estimated gross value of mill output 111,100 pesos, and the estimated profit, 37,500 pesos; development work done, 290 feet.

HIDALGO

The Santa Gertrudis deal will be closed duly as far as the British interests are concerned. It is understood that certain Mexican stockholders are opposing the deal notwithstanding that a contract has been entered into and 200,000 pesos deposited by the buyers to bind it. The reports of dissatisfaction on the part of the purchasers are unfounded.

La Blanca—A new vein has been cut in the lowest level to the south.

MEXICO

Esperanza—October returns showed 15,202 dry tons crushed, and returns from bullion and concentrates $196,136. The estimated profit is $75,472. Development work done, 1040 feet.

El Oro—October crushing, 25,888 tons, yielding bullion $215,090. The working expenses were $107,360, and expenditure on development, $26,400, leaving a mining profit of $81,330, to which was added earnings from the railroad of $6000.

Mexico Mines—Crushed in October, 10,920 tons yielding bullion $108,460. The working expenses were $35,300, and expenditure on development $11,500, leaving profit of $61,660. In addition 25 tons valued at $8000 were shipped direct to smeltery.

SONORA

Calumet & Sonora—The south drift at the 300-ft. level of the Chivera shaft shows the orebody to be of greater width than it was at either the 200- or 100-ft. levels. The mine will be in condition to supply 250 tons ore daily by Dec. 1. The concentrator of 250 tons daily capacity is nearing completion and should be ready for operation in December. The electric-light plant for lighting the surface and underground, and the concentrator has been running for some time and is giving satisfaction. Grading on the road which will connect the mine and the mill has been started. Two-ton, side-dump cars are to be used on an 18-in. track. In addition to the 6-drill compressor already in use a 12-drill compressor is being installed.

El Triunfo—This mine in Arizpa district has developed on three levels copper-silver ore of good grade. A 50-ton smeltery, using charcoal for fuel, will be installed. A. C. Charlot is in charge.

El Tigre—Tunnel No. 7, to be used for haulage and draining purposes, has been driven 1500 ft. It is below prior workings and will be 2600 ft. long when completed.

Santa Rosalia—Ore is stored on the dump for shipment, but the intention of the management is to eventually reduce the output. Frederick D. Sandtner is in charge of the mining.

Greene-Cananea—A railroad spur from the company's line to the lower tailings dam is under consideration. A quantity of these impounded slimes are sent to the smeltery each month for converter lining.

New Zealand

Gold production in October is reported at 49,905 oz. bullion, an increase of 18,880 oz. over October, 1908. The bullion this year was equal to $965,381, or 46,705 oz. fine gold. Silver production for the month was 153,167 oz., an increase of 21,824 oz. over last year.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Nov. 24—The coal trade in the West continues to be in generally good condition. A wave of cold weather has started up domestic demand, while steam coal continues to sell well at all the large centers. There is some complaint of car shortage, but it has not yet reached an acute stage, except on the lines carrying coal to the Lake ports for shipments to the Northwest. The Lake trade is in the state of rush and many dealers fear that they will not be able to fill their contracts before the ice comes.

The eastern bituminous trade is in better condition than for a good while past, and a fair business is reported for bituminous coal all along the seaboard. Car shortage is the cause of many complaints on eastern lines.

The anthracite trade is quiet and steady as usual. From now on it will be mainly a weather market.

Cumberland Coal Rates—In the suit brought by the Baltimore & Ohio and other companies to restrain the Interstate Commerce Commission from enforcing its order reducing rates on Cumberland coal to tidewater, the United States Circuit Court has sustained the demurrer filed by the commission, which asked for the dismissal of the temporary injunction. Under this decision the lower rates can be enforced.

Coal Traffic Notes

Coal tonnage of railroads in Ohio Coal Traffic Association, nine months ended Sept. 30, short tons:

	1908.	1909.	Changes.
Hocking Valley	2,269,619	2,214,870	D. 54,749
Toledo & Ohio Cent.	1,094,889	948,827	D. 146,062
Baltimore & Ohio	1,038,983	1,090,639	I. 51,656
Wheeling & L. Erie	1,987,683	2,252,717	I. 265,034
Cleve., Lorain & Wh.	1,770,575	1,800,561	I. 29,986
Zanesville & Western	882,790	801,530	D. 81,260
Toledo Div., Pen. Co.	1,130,538	1,319,187	I. 188,649
L. Erie, Alliance & Wh.	734,953	767,810	I. 32,857
Marietta, Col. & Clev.	33,763	56,433	I. 22,670
Wabash-Pitts. Term.	.....	22,888	I. 22,888
Total	10,943,793	11,275,462	I. 331,669

The total increase in tonnage this year was 3 per cent. Only the Ohio lines of the Baltimore & Ohio are included above; the main line is given elsewhere.

Shipments from mines on Norfolk & Western road, four months of fiscal year, July 1 to Oct. 31, were: Commercial coal, 4,577,790; company coal, 657,426; total, 5,235,216 short tons. Of the total shipments 3,615,127 tons were from the Pocahontas field.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, nine months ended Sept. 30, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	16,746,216	3,310,794	20,057,010
Buff., Roch. & Pitts.	4,803,810	344,714	5,148,524
Buff. & Susqueh'na	1,075,976	242,575	1,318,551
Penn. lines, N. Y. C.	5,278,843	70,985	5,349,828
Pitts. & L. Erie	6,921,267	3,838,404	10,759,671
Pitts., Shawmut & N.	634,308	12,030	646,338
Norfolk & Western	10,162,422	1,854,689	12,017,111
Ches. & Ohio	9,809,725	337,499	10,147,224
Total	55,432,567	10,011,690	65,444,257
Total, 1908	47,954,169	6,271,137	54,225,306

Total increase this year, 11,218,951 tons, or 20.7 per cent. In addition to the above, the Baltimore & Ohio carried 546,959 tons of anthracite in 1908, and 562,739 in 1909; increase, 15,780 tons.

	Anthracite.	Bitum.	Total.	PerCt.
New York	10,399,168	7,803,444	18,202,612	60.7
Philadelphia	1,445,119	3,495,763	4,940,882	16.5
Baltimore	161,941	2,543,215	2,705,156	9.0
Newp't News	.....	2,636,077	2,636,077	8.7
Norfolk	.....	1,550,431	1,550,431	5.1
Total	12,006,228	18,028,930	30,035,158	100.0
Total, 1908.	12,754,492	16,902,207	29,656,699	.....

Total increase this year, 378,459 tons, or 1.3 per cent. The gain was in bituminous coal, anthracite showing a decrease.

New York

Anthracite

Nov. 24—The anthracite market has settled down into a weather market and will probably so continue for some time. For the past week the weather has been mild, but yesterday a storm and cold wave struck the seaboard, which will probably send up sales.

Schedule prices for large sizes are unchanged at $4.75 for lump and $5 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3.10@3.25; buckwheat, $2.25@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The soft-coal market is in about the same condition as reported last week. Demand from the West still continues to affect the mines, but it is beginning to slacken, and there is a little less rush to get coal to Lake Erie ports. This will benefit seaboard shippers a little later by giving them more cars. At present car shortage continues to be a feature in the trade, and complaints are numerous from mines which have orders to fill. Coal is not coming forward as fast as it is wanted. Shippers to the shoal-water ports are beginning to get uneasy, as cold weather may come at any time and ice may cause trouble before orders are filled. Transportation continues to be irregular, and it is hard to say when shipments will reach tidewater.

Buying is fair and is pretty well distributed. The Far East is taking coal and the Sound ports are doing better than they have been. New York harbor trade is looking up a little.

Prices are firmer than they were. In some cases advances have been paid by buyers who are in a hurry. It cannot be said that there has been any general advance.

Coastwise trade is good, and rates are firm. For large vessels from Philadelphia charters are taken at 85c. per ton to Boston, Salem and Portland. Small vessels from New York harbor points command 65c. to points around Cape Cod.

Birmingham

Nov. 22—All the coal that is being mined in Alabama is finding a ready demand. The production is heavier now than it has been since the summer of 1907, and the efforts being made to bring in more labor, much of which goes to the mining section of the territory, are being felt in an increasing production. The mining companies expect still better results when the increased wage scale goes into effect Dec. 1. Contracts are said to be in hand that call for a steady delivery of coal through several months to come. The railroads are now consuming more coal than in two years. The coke demand is also steadily improving, but the make holds practically the same.

Chicago

Nov. 22—The demand for both domestic and steam coals continues good, with supplies in general well regulated so that sales at sacrifice prices are few, and prices firm. On the better grades of Illinois and Indiana domestic coals prices are advancing slightly. With continued cold weather—and November so far has been extraordinarily mild—dealers look for a large demand from country territory, for retailers' stocks are in general low.

Illinois and Indiana bring, in car lots: Lump and egg, $2@3; run-of-mine, $1.75@1.85 and screenings, $1@1.15.

Eastern coals in general are strong, with the exception of smokeless run-of-mine, which has been over-plentiful, though in good demand. Smokeless lump is fairly strong, bringing $3.60@3.80, while run-of-mine brings $3.05@3.15. Hocking is in good demand and brings the full circular

price, $3.15, generally. Other Eastern coals remain practically unchanged in prices, with good market conditions. No large surplus, indeed, exists of any coal in this market. Anthracite continues to sell well in city and country.

Cleveland

Nov. 23—Colder weather has stirred up the domestic trade. The Lake trade is still in a rushed condition, and the delay caused by the accident at the Sault is making trouble. Shippers fear that navigation will close before their contracts can be filled. Quotations are about the same.

Prices are firmer. Middle district coal brings $1.40 at mines for 1¾-in., $1.15 for ¾-in., $1.05 for run-of-mine and 70c. for slack; 70c. being added for Cleveland delivery. No. 8 district is $1.35 for 1¼-in., $1.05 for ¾-in., 95c. for run-of-mine and 60c. for slack, all at mine; 90c. being freight to Cleveland. Massillon domestic is $2.95 for lump and washed nut and $1.50 for slack; all f.o.b. Cleveland. Pittsburg coal is $2.40 for 1¼-in., $2.20 for ¾-in., $2.10 for run-of-mine and $1.65 for slack, Cleveland delivery.

Indianapolis

Nov. 22—There is no special change to report in the local market. Business continues good, both for steam and domestic coal, and the mines are generally busy. The coming of cold and stormy weather increases demand and at the same time delays shipments. Car supply is about the same as it was, some complaints of shortage coming in from different quarters.

Pittsburg

Nov. 23—The coal market is firm on contracts for forward delivery while on account of the rush to wind up Lake shipments, and the relative scarcity of cars, some producers are asking premiums on lots for immediate shipment. We quote slack at 60@70c., depending on delivery, mine-run and nut at $1.20, ¾-in. at $1.30 and small lots of domestic coal to retail dealers at $1.50, all at mine.

The Pittsburg-Buffalo Company, under date of today, has issued the following list:

	Pittsburg.	Dorothy, W. Va.	Brilliant.
Slack	$0.60	$0.60	$0.60
Nut slack	0.90	0.75	1.05
Mine run	1.20	1.00	1.05
¾-in. lump	1.30	1.15	1.15
1¼-in. lump	1.40	1.40	1.25

Connellsville Coke—The market is easier by about 5c. per ton on prompt furnace coke, other prices being unchanged. There is not much demand for prompt, as consumers are covered on contract and deliveries are better on account of the increased output. The labor supply is improving gradually in numbers and efficiency and conditions should be still better after the first of the year as it is pretty generally expected there will be a general wage advance Jan. 1, although official information is withheld. The furnaces, which have not covered for the first half, are showing little interest in the market.

The market stands at $2.85@2.90 for prompt furnace, $2.90 for contract furnace, $3@3.25 for prompt foundry and $3.25@3.50 for contract foundry.

The *Courier* reports production in the Connellsville and lower Connellsville regions in the week ended Nov. 13, at 458,329 tons, and shipments at 4834 cars to Pittsburg, 8263 cars to points west of Pittsburg and 956 cars to points east of Connellsville, a total of 14,053 cars.

St. Louis

Nov. 22—The coal market is now purely a weather market and the demand varies entirely according to the thermometer. At the first part of this week we had several brisk days which livened up things a little. However, it is now quite warm again with the result that the situation is easing up. The demand for high-grade coal from southern Illinois continues to be strong from the Northwest, though even this market does not show the strength that it has been for the past month. This has had no effect as yet on the tone of high-grade coal as the car supply has been so bad in southern Illinois that it more than makes up for any slight falling off in demand.

The car supply has been so short that a number of mines ran only one full day this week. The Illinois Central is so short of cars that the mines on the line are practically out of business. The Iron Mountain and other roads in southern Illinois are also exceedingly short, but seem to be giving better service than the Illinois Central. The Chicago & Eastern Illinois seems to be the only Illinois road in the State which is even doing fairly well in the matter of car supply. The mines in the central Illinois field have also been very short of cars all week and have been able to run only one-half time. The Louisville & Nashville yesterday placed an embargo on all coal moving outside of switching limits of St. Louis. By this means it hopes to husband the car supply and, although it restricts the market very much for their operators, yet they feel that on the whole this is the best way to keep their tonnage up. The warm weather having slowed up the production of lump coal has had the effect of stiffening up the market on fine coal and prices in general on the smalled sizes are about 10c. per ton better than have been prevailing for the last month.

Standard 6-in lump is being offered freely at $1.10 mine, or $1.62 St. Louis; 2-in. lump is bringing 95c. mine, or $1.47 St. Louis; 3-in. nut coal is being quoted 80c. at mine, or $1.32 St. Louis; 1½- to 2-in. steam nut coal is 50@60c. mine, or $1.02@1.12 St. Louis. Nut and pea are worth 30c. mine, or 82c. St. Louis, while 1½-in. screenings are now 10c. mine, or 62c. St. Louis.

Staunton, Mt. Olive, or Springfield district 6-in. lump is quoted at $1.50 mine, or $2.02 St. Louis; 2-in. lump is $1.20 at mine, or $1.72 St. Louis; 2-in. nut is 85c. mine, or $1.37 St. Louis.

Carterville 6-in. lump or egg is held strong at $1.75 per ton at mine, or $2.42 St. Louis; 3- to 2-in. nut is bringing $1.35 per ton mine, or $2.02 St. Louis.

Franklin county 6-in. lump is strong at $2 per ton mine, or $2.67 St. Louis; 3- to 2-in. nut coal is $1.50 per ton mine, or $2.17 per ton St. Louis. At present nearly all of this coal is going to the Northwest.

The market on anthracite remains unchanged; chestnut is in strong demand while other sizes are slow.

Foreign Coal Trade

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, 10 months ended Oct. 31, long tons:

	1908.	1909.	Changes.	
Coal	52,423,508	52,272,368	D.	151,140
Coke	958,102	947,554	D.	10,548
Briquets	1,244,869	1,235,282	D.	9,587
Total exports	54,626,479	54,455,204	D.	171,275
Steamer coal	16,218,324	16,410,514	I.	192,190
Total	70,844,803	70,865,718	I.	20,91

The larger exports this year were 8,650,699 tons to France, 7,988,976 to Germany, 7,660,966 to Italy and 3,203,382 tons to Sweden.

Austrian Coal Production—Coal production of Austria, nine months ended Sept. 30, metric tons:

	1908.	1909.	Changes	
Coal	10,664,558	10,344,934	D.	319,624
Brown coal	20,058,522	19,148,094	D.	910,428
Total mined	30,723,080	29,493,028	D.	1,230,052
Coke made	1,450,463	1,403,612	D.	46,851
Briquets made	249,800	268,941	I.	19,141

Of the briquets reported this year 133,449 tons were made from brown coal, or lignite.

Transvaal Coal—The total coal mined in the Transvaal for the nine months ended Sept. 30 was 3,658,749 tons. The total shipped and sold was 2,669,354 tons. The balance was used at mines, or sorted and screened out as waste. The average value at mines was $1.22 per ton.

Spanish Imports—Imports of coal into Spain, nine months ended Sept. 30, were 1,527,047 metric tons, an increase of 100,390 tons; imports of coke, 223,879 tons, an increase of 7084 tons over last year.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Nov. 6: Best Welsh steam, $4.08; seconds, $3.84; thirds, $3.66; dry coals, $3.84; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.28; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Nov. 24—The comparative lull in the iron and steel trades continues and it appears quite probable that quieter times are ahead, at least until buying for the needs of the second and third quarters of 1910 begins. It is not likely that this buying will fairly set in much before the close of the year. This does not mean that business is dead, however, for the mills are generally full of work and there is every prospect that they will continue so for a good while to come.

In pig iron the buying in eastern territory has been chiefly of small lots of foundry. In the central West the steel companies are still picking up outside bessemer and there is quite a demand for basic pig. Some good orders for basic from Virginia furnaces are reported, mostly for eastern delivery.

In finished material there is a fair demand for bars and railroad supplies, and the railroads continue to put in orders for new cars which will absorb a good deal of material. Structural steel is quiet just now, although there is talk of some large contracts which may come forward for spring work.

Lake Superior iron-ore shipments were delayed last week by an accident to the Poe lock at Sault Ste. Marie. This will reduce the November shipments a little and the companies are all rushing work to get off as much ore as possible before navigation closes. No action has yet been taken about ore prices for next season.

Foreign Iron Ore—The receipts of foreign iron ore at Philadelphia this year have been unusually large. For the year to Nov. 20 they reached a total of 1,017,000 tons. Receipts at Baltimore to Oct. 31 were 665,000 tons. It appears that some ore is to come from Africa; a Berlin despatch reporting that the Otavi Mining Company in German Southwest Africa has made a contract to send 100,000 tons to this country, the first cargo to be shipped in December.

Baltimore

Nov. 23—Imports for the week included 1312 tons ferromanganese and 203 tons silicospiegel from Liverpool; 5018 tons cupreous pyrites from Spain; 16,550 tons iron ore from Cuba. Exports included 567,971 lb. tin scrap to Rotterdam; 2296 tons rails and 222,900 lb. splice-bars to Brazil: 578,924 lb. galvanized sheets to Liverpool.

Birmingham

Nov. 22—The Southern pig-iron market continues strong despite the fact that the lull in buying is still on, and in some quarters a concession is being made on the price. No. 2 foundry is quoted at $15 per ton, delivery during the first half of the coming year, but $1 under that price is said to be made by some of the smaller producers. The strength of the market is encouraging and the manufacturers are not thinking of cutting down the active production. There is more iron being shipped or melted than is being manufactured in this territory. The fact that some of the producers have notified speculators, brokers and others who have a large quantity of iron stacked in the yards here that storage charges will be made has caused the removal of a good block of this iron. The furnace companies are accumulating a little iron of their own, but not to any great extent. The indications are there will be no disturbance in the production during the balance of the month. The pipe people have a strong trade, some new contracts having been secured recently. Cast-iron pipe prices have gone up a little in this section, $25 per ton being a basis.

The operations at the steel plant in this district show no change. While the full capacity of the steel-rail mill is not on, inasmuch as something like 6000 tons of fabricated steel is being produced monthly at the Bessemer rolling mills—also property of the Tennessee company—there is much work being done. Another large consignment of rail is being made on the Argentine railroad order received some time ago; three cargoes are to leave Pensacola, Fla., soon for Buenos Aires. Satisfaction is expressed on the announcement that the American Steel and Wire Company will put up at once a large plant in the Birmingham district. Machine shops and foundries throughout the South are busy these days and are giving employment to more men every week.

Cleveland

Nov. 23—The accident to the Pre lock at the Sault Ste. Marie, one of the gates being rammed by a big freighter, put the lock out of commission for 10 days, materially reducing the capacity of the canals at a critical time, and reducing the arrivals of iron ore.

Pig Iron—The market is quiet just now, but prices remain firm, with no change from last week.

Finished Material—The biggest business for the week has been in railroad supplies and in bars. The bar demand is heavy, and it is difficult to get early deliveries, the mills being full.

Chicago

Nov. 22—The iron market continues quiet, with a steady buying of pig iron in small amounts and no indication of weakening in prices. As there is a slackening of inquiries, it would seem that the melters have about reached their limit of need caused by several months of light buying and will proceed now on an even basis of steady probable needs. Furnaces seem to be well adjusted to this condition and sellers of both Northern and Southern express no apprehension. Northern iron continues to be strong at $19@19.50 for No. 2, and Southern holds to about $15 Birmingham ($19.35 Chicago), with a variation of 50c. above and below this price according to special conditions. Considerable resale iron appears, at low prices.

The demand for iron and steel finished products continues generally heavy, despite some advances in prices. Railroad supplies are in steady demand and structural material shows a wide distribution of sales. Coke is somewhat weaker but holds to $5.50 for both Connellsville and Wise county.

Philadelphia

Nov. 24—The volume of business in pig iron has fallen off. This does not mean that iron could not be sold if it could be delivered to suit buyers. Quite a number of small concerns, especially foundry people who were overcautious or indifferent a month or two ago, would like to place orders at present, though few of them are in urgent need. There are more foundry-iron buyers than any other kind. The bar-mill people are pretty well supplied for the present. Steel-making irons are, of course, scarce and higher. Basic irons are next to impossible to get at any price. There is less anxiety this week to buy iron for mid-winter delivery than there was last week. Some buyers comfort themselves by saying that the danger of a further advance is past. Basic is nominally $19; gray forge $18, and No. 2X foundry $19@19.50 per ton.

Steel Billets—Importations of steel billets have taken place in large lots and further dependence for winter supplies will be had on this source. The price in this market is $29.25.

Bars—Common and refined iron are in excellent request from both large and small consumers. All of the mills are running full time at the higher level of prices for new business. Steel bars have also advanced and the capacity is strained to the utmost.

Scrap—There has been a free movement in some of the lower grades of scrap, such as borings and turnings, while the higher grades such as railroad scrap and heavy melting steel have not been called for.

Pittsburg

Nov. 23—The iron and steel market is relatively quiet all along the line as to new buying, and in some quarters the tone is not regarded as altogether as strong as it was, although there are no evidences of actual weakness at any point. The mills are still congested with specifications in most lines. The quietness in the market is due in part to the conservatism of the mills, which are restricting sales to definite requirements of customers and are avoiding commitments to jobbers for far forward delivery.

Pig Iron—The market continues quiet and as to foundry grades is not over strong. As noted in previous reports, one Valley furnace has been an aggressive seller, at cut prices, but it is now less active. The views of other furnaces have not been greatly influenced by the incident. A local machine interest is in the market for 2250 tons of foundry iron, 250 tons for December and the balance for first half. We note a sale of 100 tons of prompt bessemer at $19.10, Valley. The market is quotable at Valley furnace—90c. higher delivered Pittsburg—as follows: Bessemer, $19@19.10; basic, $17.25@17.50; No. 2 foundry, $17.25@17.50; malleable, $17.50@18; gray forge, $16.25@16.50 per ton.

Steel—No important sales of sheet-bars are reported since it became generally recognized that the price for first quarter would be $30, f.o.b. Pittsburg mill. The Carnegie Steel Company is not selling, nor are the Youngstown Sheet and Tube Company and Republic Iron and Steel Company, while the Jones & Laughlin company seems to have stopped making sheet-bars. The Lackawanna Sttel Company is likely to have a limited tonnage available. Billets are scarce and prices are largely nominal. We quote sheet-bars at $28@30 and billets at $27@28, Pittsburg, depending on delivery.

Ferromanganese—The advancing market continues. Consumers already supposed to be covered are taking additional tonnages. Prompt metal is $45@46 and first half $45.50@46, f.o.b. Baltimore; freight to Pittsburg $1.95 per ton.

Sheets—Demand is fair and mills continue conservative in selling ahead. Last week the independent mills able to make good deliveries on blue annealed sheets advanced their prices $1 a ton to 1.80c. for No. 10 gage, thus placing themselves again $1 above the leading interest, which does not promise deliveries on blue annealed sheets in less than about three months. Prices are: black sheets, 28 gage, 2.40c.; galvanized, 3.50c.; blue annealed, 10 gage, 1.75@1.80c.; painted corrugated roofing, $1.70; galvanized, $3 per square.

St. Louis

Nov. 22—The demand for pig iron for the past week has been quiet. Nearly all the larger users seem satisfied for the present and only odds and ends of business are being closed now. Business is liable to be quiet from now on until selling for the second quarter commences. Prices on No. 2 foundry iron remain unchanged at $15@15.25 per ton Birmingham, or $18.75@19 St. Louis. The furnaces are stocked up on high-silicon iron which they are offering this week.

Iron Ore—The demand for 50 per cent. Missouri ore at $3.50@3.75 per ton, f.o.b. St. Louis, has been strong and difficulty has been experienced in getting shipments made.

Sault Ste. Marie Canal Traffic

The total freight passing through the Sault Ste. Marie canals in October was 9,127,240 short tons, or about 100,000 tons less than in September. For the season to Nov. 1 the total movement was, in short tons:

	1908.	1909.	Changes.
East-bound	24,734,614	38,606,780	I. 13,872,166
West-bound	9,341,730	9,559,908	I. 218,178
Total	34,076,344	48,166,688	I. 14,090,344

In October, as in September, the Canadian canal carried a larger proportion of the traffic than ever before. The mineral freights included for the season were, in short tons, except salt, which is in barrels, as follows:

	1908.	1909.	Changes.
Coal	8,444,735	8,316,830	D. 127,905
Iron ore	20,953,638	34,395,380	I. 13,441,742
Pig and man. iron.	235,607	407,594	I. 171,987
Copper	75,708	94,230	I. 18,522
Building stone	1,019	1,674	I. 655
Salt, bbl.	467,777	531,065	I. 63,288

Iron ore was 71.4 per cent. of the total freight this year, and coal 17.3 per cent.

Foreign Iron Trade

German Iron Production—The German Iron and Steel Union reports the production of pig iron in Germany in September at 1,068,345 tons, or 32,326 tons less than in August. For the nine months ended Sept. 30 the output was, in metric tons:

	1908.	1909.	Changes.
Foundry iron	1,668,587	1,804,190	I. 135,603
Forge iron	495,194	504,503	I. 9,309
Steel pig	704,940	810,818	I. 105,878
Bessemer pig	297,039	307,435	I. 10,396
Thomas(basic)pig	5,758,905	6,082,091	I. 323,186
Total	8,924,665	9,509,037	I. 584,372

The total increase this year was 6.5 per cent. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

British Iron Trade—Exports and imports of iron and steel in Great Britain, nine months ended Sept. 30, are valued as below by the Board of Trade returns:

	Exports.	Imports.	Excess.
Iron and steel	£27,826,523	£ 5,860,808	Ex. £21,965,715
Machinery	21,089,186	3,438,275	Ex. 17,650,911
New ships	4,831,561	.....	Ex. 4,831,561
Total	£53,747,270	£ 9,299,083	Ex. £44,448,187
Total, 1908	59,825,166	9,195,087	Ex. 50,629,179

Decrease in exports, £6,077,896, or 10.2 per cent.; this loss was in new ships and machinery. Increase in imports, £103,096, or 1.1 per cent. The quantities of iron and steel were, in long tons:

	1908.	1909.	Changes.
Exports	3,109,120	3,074,202	D. 34,918
Imports	791,649	877,651	I. 86,002

The increase in imports was chiefly in ingots, blooms and other half-finished material.

British Iron Ore Imports—Imports of iron ore into Great Britain, nine months ended Sept. 30, were 4,428,896 long tons in 1908, and 4,572,874 in 1909; increase, 143,978 tons. Of the imports this year 3,429,823 tons were from Spain.

Metal Markets

New York, Nov. 24—The metal markets have shown a good degree of activity, and some tendency to advancing prices, followed by a reaction. The rise in some of the minor metals is noticeable.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1909..	$ 9,379,402	$ 7,034,164	Exp. $ 2,245,438
" 1908..	1,952,574	3,785,705	Imp. 1,833,131
Year 1909..	106,652,236	38,139,557	Exp. 68,512,679
" 1908..	70,889,954	42,213,678	" 28,676,276
Silver:			
Oct. 1909..	4,053,745	4,017,884	Exp. 35,861
" 1908..	4,378,015	3,746,863	" 631,652
Year 1909..	47,342,861	37,258,414	" 10,084,447
" 1908..	43,159,395	34,539,067	" 8,620,328

Exports from the port of New York, week ended Nov. 20: Gold, $2,220,700, to Argentina and Brazil; silver, $682,190, to London and Paris. Imports: Gold, $78,974; silver, $216,706, from Australia, Japan, South America and Mexico.

Treasury Department estimate of money in the United States on Nov. 1:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury)	$ 175,284,067	$ 598,773,175
Gold certificates	79,451,380	795,205,489
Silver dollars	2,271,862	74,383,857
Silver certificates	5,792,111	481,794,889
Subsidiary silver	17,952,453	142,324,038
Treasury notes of 1890	12,465	4,021,535
U. S. notes	4,501,054	342,179,962
Nat. bank notes	17,944,644	685,996,112
Total	$303,210,056	$3,124,679,057

Population of the United States Nov. 1 estimated at 89,404,000; circulation per capita, $34.95. The total amount in circulation shows increases of $3,369,031 over Oct. 31, and of $26,181,036 over Nov. 1 last year.

Foreign trade of the United States, 10 months ended Oct. 31, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1908.	1909.
Exports	$1,402,751,887	$1,359,535,399
Imports	900,538,278	1,195,505,608
Excess, exports	$ 502,213,609	$ 164,029,791
Add excess of exports, silver		10,084,447
Add excess of exports, gold		68,512,679
Total export balance		$ 242,626,817

The gold and silver movement in detail will be found in the table at the head of this column.

Gold and silver movement in Great Britain, 10 months ended Oct. 31:

	Imports.	Exports.	Excess.
Gold	£43,071,192	£40,346,564	Imp. £2,724,628
Gold, 1908	38,710,965	38,885,521	Exp. 1,174,556
Silver	10,160,161	10,199,750	Exp. 39,589
Silver, 1908	8,798,269	11,178,436	Exp. 2,380,167

Of silver imports this year a total of £8,529,764 is credited to the United States.

Corrected returns from the Transvaal show a total gold production of $12,451,939 for October, and of $125,627,919 for the 10 months ended Oct. 31; showing an increase of $6,204,865 over the corresponding period of last year.

Gold—With a fair demand, chiefly from the Bank of England, the price of gold on the open market in London continued at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. In New York more gold was taken for shipment to South America.

Platinum—Business continues good, the jewelry trade taking a good deal of metal, as is usual at this season. The price remains unchanged, dealers still asking $29.50 per oz. for refined platinum and $33.25 for hard metal.

Silver—The market has been held by China operations. Exports from that country have been in excess of imports, and apparently this has had much to do with its ability to offer some staying quality to the position of silver.

SILVER AND STERLING EXCHANGE

Nov.	18	19	20	22	23	24
New York....	50⅜	50¾	50¾	50¾	50¾	50¾
London.....	23⅛	23⅛	23⅛	23⅛	23⅛	23⅛
Sterling Ex..	4.8725	4.8730	4.8740	4.8745	4.8745	4.8750

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Nov. 11, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 8,280,623	£5,351,000	D. £2,899,623
China.....	516,400	1,829,300	I. 1,312,900
Straits.....	164,885	82,800	D. 82,085
Total.....	£ 8,931,908	£7,263,100	D. £1,668,808

Indian exchange in London for the week, 16.09d. per rupee.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
18	13½ @13¾	13¼ @13½	60¼	30¾	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.25
19	13¾ @14	13⅜ @13⅝	60¾	31¼	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.25
20	13¾ @14	13⅜ @13⅝	....	31¼	4.35 @4.37½	4.22½ @4.27½	6.22½ @6.25
22	13⅝ @13⅞	13⅜ @13⅝	60⅛	31½	4.37½ @4.40	4.22½ @4.27½	6.22½ @6.25
23	13⅝ @13⅞	13⅜ @13⅝	59¾	31⅜	4.37½ @4.40	4.22½ @4.27½	6.22½ @6.25
24	13½ @13¾	13¼ @13½	59⅛	31	4.37½ @4.40	4.22½ @4.27½	6.22½ @6.25

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Up to Monday of this week activity in the copper market continued unabated, and heavy sales were made for delivery over the next three months, and producers generally are now well sold for these deliveries. Manufacturers of copper also booked a large volume of business, the reports of an impending combination and curtailment of production having aroused the ultimate consumers out of their apathetic attitude. This week, in consequence of the Standard Oil decision, buyers have held aloof, waiting to see in how far this would affect the plans with respect to copper above referred to. The best opinion on this point is that these plans are not in conflict with the law, and they will be carried through. In the meanwhile some sellers have offered both Lake and electrolytic copper at concessions from the prices made last week. At the close the market is nominal at 13½@13¾c. for Lake copper, and 13¼@13½c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13⅛@13⅜ cents.

Copper sheets are 18c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has again been advanced to 15¼c. base, carload lots at mill. Business is excellent.

The doubt which has been raised by the Standard Oil decision with regard to the plans respecting copper found its most pronounced expression in the London standard market. That market had advanced on Friday to £60 15s. for spot, but early this week it was flooded with a large number of selling orders on the part of speculators who desired to realize, and in consequence declined on Wednesday morning to £58 12s. 6d., but closes somewhat higher at £59 2s. 6d. for spot and £60 5s. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £74 10s.@£75 10s. per ton.

Exports of copper for the week from New York and Philadelphia were 6813 long tons. Our special correspondent gives exports from Baltimore at 3093 tons copper.

Tin—The market in the middle of last week showed considerable strength both here and in London. The latter market was influenced by a large demand from this side and advanced almost £2 from Nov. 18 to Nov. 19. The high-water mark was reached on Nov. 22 when the London quotations reached about £142 15s. for spot and £144 17s. 6d. for three months, while this market advanced to about 31½c. Since then a reaction has set in brought about by a marked falling off in the demand on this side and by realizing on the part of London speculators, and the close is weak at £140 5s. for spot and £142 5s. for three months, and about 31c. in the domestic market.

Lead—The market is somewhat firmer at 4.22½@4.27½c. St. Louis, and 4.37½@4.40c. New York. The nominal price of the American Smelting and Refining Company for desilverized continues to be 4.40c., New York.

The London market is unchanged at £13 2s. 6d. for Spanish, and £13 5s. for English lead.

Spelter—The market is quiet with some demand from day to day, and prices are unchanged at 6.37½@6.40c. New York, and 6.22½@6.25c. St. Louis.

New York quotations for spelter Nov. 18 to 24, inclusive, were 6.37½@6.40 cents.

Base price for zinc sheets is 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The market abroad is firm, the close being cabled at £23 5s. for good ordinaries, and £23 10s. for specials.

The Western zinc smelters are at present producing at the rate of about 18,000 tons of spelter per month, every plant, with a single exception, being operated at full capacity. Some unfavorable opinion is expressed as to the gas situation in Kansas, wherefore some authorities think it doubtful if the present rate of production, namely, 215,000 tons per annum, can be materially exceeded.

Imports and exports of spelter and zinc products in Germany, nine months ended Sept. 30, metric tons:

	Imports 1908.	Imports 1909.	Exports 1908.	Exports 1909.
Spelter.....	22,681	30,987	49,741	54,92
Scrap.....	1,201	1,833	4,207	4,605
Zinc sheets.....	268	66	12,448	13,539
Zinc dust.....	848	574	1,830	2,456
Zinc oxide, etc.....	5,599	5,219	19,680	19,009

Imports of zinc ores 137,873 tons in 1908, and 153,044 in 1909. Exports of ores, 26,045 tons in 1908, and 35,285 tons this year.

Other Metals

Antimony—The market is dull and no change is expected before the end of the year. Prices are unchanged. Cookson's is quoted at 8⅜@8½c. per lb.; Hallett's 8¼@8⅜c.; U. S., 7⅞@8c.; outside brands, 7⅝@7¾c. per pound.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

The Aluminum Company of America has taken a contract for 1,500,000 lb. aluminum wire for an electric installation in Ontario.

Quicksilver — The market continues strong. In New York the quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask, with jobbers asking 2s. 6d. more.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 20—The highest price paid for zinc sulphide ore was $54 per ton, the assay base price ranging from $50 to $52.50 per ton of 60 per cent. zinc, on the general market, though some bins of ore carrying over 4 per cent. of iron sold on a base of $53 per ton. Zinc-silicate ore sold on a base price of $28@30 per ton of 40 per cent. zinc, and sold as high as $36 per ton. The average price, all grades, was $48.06. In the lead-ore market some ore sold on a base price of $53 per ton of 80 per cent. lead, but the general market was straight $50@53. The average price, all grades, was $52.42 per ton.

Outputting conditions improved materially toward the end of the week, the outlook early in the week being gloomy. Still the production was below an average, and many of the shallow mines made little ore, the shipment in some cases being from a reserve stock. The entire shipment was above an average, which means a reduction in the stock in the bins.

SHIPMENTS, WEEK ENDED NOV. 20.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,250,650	641,730	$125,236
Joplin	1,810,510	136,350	50,200
Duenweg	848,330	52,130	21,699
Prosperity	581,440	96,420	17,356
Galena	624,050	53,480	17,004
Miami	446,230	65,990	11,549
Quapaw	360,190	71,430	10,681
Aurora	476,250	84,320	10,572
Spurgeon	435,360	92,140	10,228
Alba-Neck	335,540	.....	8,724
Cave Springs	322,110	.....	8,052
Saginaw	382,070	11,040	7,137
Badger	231,750	.....	5,909
Granby	369,200	2,800	5,900
Sarcoxie	255,520	.....	5,330
Carthage	201,810	.....	5,247
Zincite	195,270	.....	5,076
Oronogo	227,060	2,310	5,051
Carl Junction	85,330	.....	2,303
Jackson	86,000	.....	2,101
Stott City	63,330	.....	1,583
Totals	12,588,000	1,310,140	$336,938
47 weeks	534,998,070	79,946,070	$12,991,031

Zinc value, the week, $302,593; 47 weeks, $10,809,268
Lead value, the week, 34,345; 47 weeks, 2,181,763

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	38.63	34.08	37.01	52.47	55.63
May	34.19	40.06	33.39	37.42	56.05	56.59
June	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August	36.53	48.25	33.42	44.54	60.34	57.60
September	37.63	47.70	34.44	44.87	54.59	56.11
October	35.95	49.50	33.28	45.75	52.63	55.02
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Nov. 20—The highest price paid this week for zinc ore was $50 per ton; the base price, 60 per cent. zinc, was $49.50@51. The base price paid for lead ore, 80 per cent., was $53@54 per ton.

SHIPMENTS, WEEK ENDED NOV. 20.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	538,780	.....	162,500
Mineral Point	424,000	.....	.....
Benton	250,250	.....	.....
Galena	240,000	.....	.....
Days Siding	160,000	.....	.....
Harker	154,700	.....	.....
Linden	146,990	.....	66,860
Shullsburg	76,000	.....	.....
Dodgeville	75,000	.....	.....
Highland	65,700	.....	.....
Cuba City	65,670	.....	65,000
Total	2,197,090	.....	294,360
Year to Nov. 20	123,840,145	8,139,645	13,860,545

In addition to the above there was shipped to the separating plants, Platteville, Galena and Mineral Point, 1,322,140 lb. zinc ore.

Petroleum

Exports of petroleum and its products from the United States, 10 months ended Oct. 31, in gallons:

	1908.	1909.
Crude petroleum	82,224,798	118,234,099
Naphthas	31,008,721	51,365,885
Illuminating oil	959,369,736	870,806,530
Lubricating and paraffin	119,145,071	126,499,655
Residuum	63,743,877	80,230,318
Total	1,255,492,203	1,247,136,487

The total decrease this year was 8,355,716 gal., or 0.7 per cent.

Chemicals

New York, Nov. 24—No renewal of activity can be noted in the chemical market generally, and there are few changes in price.

Copper Sulphate—The market is quiet at unchanged prices. Quotations are still $3.95 per 100 lb. for carload lots or over, and $4.20 per 100 lb. for smaller parcels.

Arsenic—Prospects appear good for better trading in the near future; but, at present, prices for white arsenic are unchanged at 2.75c. per lb. for both spot and futures.

Nitrate of Soda—Business in this article continues on a moderate scale only. Spot prices are unchanged at 2.07½c. per lb., but futures are a shade easier, at 2.07½c. per lb., the same as spot.

Sulphur—Shipments of sulphur from Sicily for the nine months ended Sept. 30 were 301,127 metric tons in 1908, and 282,015 in 1909; a decrease of 19,112 tons. Shipments to North America, included in the totals, were 11,123 tons in 1908, and 12,878 in 1909; an increase of 1755 tons. Stocks Sept. 30 were 621,016 tons, an increase of 33,135 tons over Sept. 30 of last year.

Mining Stocks

New York, Nov. 24—The general stock markets have again been irregular and somewhat disturbed, but with no very heavy fluctuations. The principal topic of discussion this week was the decision of the United States Circuit Court in the Standard Oil case. This has seriously disturbed Wall Street, as it is difficult to say how far the effects of the decision will extend and how many other companies may come within its scope. An appeal will be taken, of course, but the general impression is that the decision will stand.

Amalgamated Copper sold off several points from the high level recently reached. Homestake, of South Dakota, sold off from $80 to $74.50 per share on sales of 680 shares; the cause being the strike at the mine and some other unfavorable reports.

On the Curb coppers were not specially active and generally inclined to be weak. The main interest was in Standard Oil, which declined $45 per share. The Cobalt stocks held their price pretty well, but they were rather neglected as were also the Nevada gold stocks. Curb talk is that the Standard decision will prevent the formation of the much talked of copper combination.

Boston, Nov. 23—Copper shares responded nobly to the proposed copper merger. Those shares mentioned as likely to go into the combine were the features early, but the Lake issues also had their innings, particularly Lake Copper, which has advanced $8.25 to $49 per share. The fact that this mine is preparing to send daily shipments of ore for treatment at the Franklin mill will put it among the list of producers at an early date.

The whole copper-share list has been active and strong and record prices have been made frequently during the week. At times the market has been very near the boiling point and commission orders have been greatly increased by the advent of the public into the market. A sharp reaction followed the decision in the case of the Government against the Standard Oil Company, but prices quickly recovered and the outlook is for an active and higher market the balance of the year.

Amalgamated has been persistently accumulated and brokers' offices are almost bare of this issue. The price rose $3.37½ to $96.12½, but reaction to $87.75 followed with a fair-sized recovery from this. Calumet & Arizona spurted $7.50 to $110.50, on anticipated increased-dividend action, but reaction to $106 followed on announcement of the regular $1 quarterly rate. Utah Copper did not reach the level attained in New York, but did rise.

Curb trading has not brought any particular movements outside of a few. Chino rose $1.50 to $10, but did not all of the advance. Corbin Copper also moved up $2.75 to $8.75. The general trend of prices on the Curb is toward higher levels, however, for the better class of stocks.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI			
XII			

VISIBLE STOCKS.

	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII			

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	.....	22.933	.....
December	48.766	.....	22.493	.....
Total	52.864	.....	24.402	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK. Electrolytic 1908.	Electrolytic 1909.	Lake. 1908.	Lake. 1909.	LONDON. 1908.	LONDON. 1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56⅛	12.928	12.93⅞	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	12.700	13.646	13.030	60.139	57.551
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	.....
June	28.024	29.322	December	29.154	.....
			Av. year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	.....	.....	13.538	....
December	4.213	.....	.....	13.166	.
Year	4.200	.....	.....	13.439	....

London, pounds sterling per long ton.
New York and St. Louis, cents per pound.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	.....	4.909	.....	20.875	
December	5.137	.....	4.987	.....	20.625	
Year	4.726	.....	4.578	.....	20.163	

New York and St. Louis, cents per pound.
London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Nov. 24 Name of Comp.	Clg.
Alaska Mine	‡.11
Amalgamated	89⅛
Anaconda	50⅛
Balaklala	‡2 1/16
British Col. Cop.	7
Buffalo Mines	3½
Butte Coalition	30⅞
Colonial Silver	⅝
Cum. Ely Mining	8¾
Davis-Daly	6⅛
Dominion Cop.	7
Douglas Copper	1⅜
El Rayo	2¼
Florence	2⅞
Foster Cobalt	‡.32
Furnace Creek	‡.05
Giroux	11
Gold Hill	1¾
Goldfield Con.	7⅞
Granby	‡101
Greene Gold	‡⅛
Greene G. & S.	19
Guanajuato	2
Guggen. Exp.	240
Hanapah	‡15
Kerr Lake	8
McKinley-Dar.	.81
Miami Copper	17
Micmac	⅜
Mines Co. of Am.	⅜
Montezu. of C. R.	11
Mont. Sho. C.	1½
Nev. Utah M. & S.	1⅜
Newhouse M. & S.	3¾
Nipissing Mines	10½
Old Hundred	⅜
Silver Queen	.29
Stewart	⅞
Tennessee Cop'r.	40
Tri-Bullion	1⅛
United Copper	9
Utah Apex	5⅛
Utah Copper	61
Yukon Gold	5

‡Last quotation.

BOSTON Nov. 24 Name of Comp.	Clg.
Adventure	5⅛
Allouez	57
Am. Zinc	36¾
Arcadian	4½
Arizona Com.	44¾
Atlantic	11½
Boston Con.	19¾
Calumet & Ariz.	104
Calumet & Hecla	680
Centennial	38
Copper Range	93½
Daly-West	9⅝
East Butte	12½
Franklin	16¾
Greene—Can	12⅜
Hancock	16½
Isle Royal	26¼
Keweenaw	3
La Salle	16
Mass.	6¼
Michigan	7
Mohawk	63
Nevada	27⅞
North Butte	64¾
Ojibway	8
Old Colony	‡.50
Old Dominion	.54
Osceola	160
Parrot	30¾
Quincy	87
Rhode Island	10¾
Shannon	16¼
Superior	65½
Superior & Bost.	15
Superior & Pitts.	16⅞
Tamarack	67
Trinity	11
U. S. Smg. & Ref.	56
U.S.Sm. & Re., pd.	53
Utah Con.	46¾
Victoria	8½
Winona	7¼
Wolverine	149
Wyandotte	2

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	48
Am. Smelt. & Ref.	100⅜
Am.Sm. & Ref., pf.	111½
Colo. Fuel & Iron.	49⅜
Federal M. & S., pf.	90
National Lead	88½
National Lead, pf.	‡110½
Pittsburg Coal	26⅞
Republic I. & S.	46¾
Republic I. & S., pf.	105½
Sloss-Sheffield	88½
Standard Oil	674
U. S. Steel	88⅞
U. S. Steel, pf.	125
Va. Car. Chem.	48⅞

BOSTON CURB	Low.
Ahmeek	215
Chemung	15½
Chino	8¾
Gila	8¾
Indiana	7¾
Mason Valley	1⅞
Ray Central	2½
Ray Con	21½
San Antonio	10
Yuma	1¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Nov. 20 N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.09	.07
Center Cr'k	1.80	1.60
Cent.C.&C.	85.00	84.00
C.C. & C. pf.	84.00	83.00
Cent. Oil	105.00	100.00
Columbia	9.00	7.00
Con. Coal	18.00	17.00
Doe Run	110.00	105.00
Gra. Bimet.	.30	.25
St. Joe	12.50	11.00

LONDON Nov. 24 Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton's Ind.	0 3 3
Camp Bird	1 7 6
Esperanza	2 15 0
Tomboy	0 18 9
El Oro	1 5 6
Oroville	0 10 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Nov. 24.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	.90
Best & Belcher	.55
Caledonia	.39
Chollar	.26
Comstock	‡.33
Con. Cal. & Va.	.87
Crown Point	.85
Exchequer	‡ 43
Gould & Curry	.25
Hale & Norcross	.40
Mexican	1 25
Ophir	1.47
Overman	.54
Potosi	45
Savage	.48
Sierra Nevada	.49
Union	.55
Utah	.08
Yellow Jacket	.90
TONOPAH STOCKS	
Belmont	.65
Extension	.47
Golden Anchor	...
Jim Butler	.10
MacNamara	.27
Midway	.15
Montana	75
North Star	‡.02
Tono'h Mine of N.	6.50
West End Con.	.21
GOLDFI'D STOCKS	
Adams	‡.01
Atlanta	.10
Blue Bell	.02
Booth	.09
C.O.D. Con	.06
Columbia Mt.	.06
Comb. Frac.	.50
Cracker Jack	‡.01
Dia'dfield B. B. C.	.01
Florence	2.37½
Goldfield Belmont	.04
Goldfield Daisy	.07
Great Bend	.03
Jumbo Extension	.12
Kendall	‡ 02
Lone Star	‡.02
May Queen	.04
Oro	.03
Red Hill	.02
Sandstorm	‡.05

Name of Comp.	Bid.
Silver Pick	.08
St. Ives	05
Triangle	‡.01
BULLFROG STOCKS	
Gibraltar	‡ 02
Homestake King.	‡ 01
Mont. Shoshone C.	1.37½
Tramp Cons.	04
MISCELLANEOUS	
Cumberland Ely.	8.50
Giroux	10.62½
Greenwa'r Copper	.07
Nevada Con.	27.62½
Nevada Hills	.70
Navada Smelting.	.75
Nevada Wonder	.60
Nevada-Utah	1.12½
Penn-Wyoming	...
Pittsburgh S. Pk.	.65
Ray Central	2.37½
Ray Con	21.00
Round Mt. Sphinx	‡ 05

COLO. SPRINGS Nov. 23 Name of Comp.	Clg.
Acacia	.07½
C. C. Con	‡.03
Doctor	.08
Elkton	.69½
El Paso	.61½
Findlay	.10
Gold Dollar	.13
Gold Sovereign	.04¼
Isabella	.18¼
Jack Pot	‡.06½
Jennie Sample	‡.08
Jerry Johnson	.08
Lexington	‡.01¾
Mary McKinney	.47½
Old Gold	‡.04
Pharmacist	‡.03¼
Portland	.82
U. G. M.	‡.08
Vindicator	‡.70
Work	‡.06

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	Nov. 11	Dec. 7	$0.05
Arcadian Copper, Mich.	.....	Mar. 1	0.50
Camp Bird Min. Co., Colo.	Dec. 13	.....	0.002
Chemung Copper, N. M.	Jan. 1	Jan. 2	1.00
Chollar, Nev.	Nov. 8	Dec. 1	0.10
Crown Point, Nev.	Nov. 30	Dec. 20	0.10
Hancock Min., Mich.	.....	Feb. 1	1.00
Hypothek, Ida.	Sept. 30	Dec. 1	0.005
King Philip Copper, Mich.	Dec. 10	.....	1.00
Marie M. Co., Ida.	Oct. 30	Nov. 30	0.002
Mexican, Nev.	Dec. 6	Dec. 29	0.10
Mineral Flat, Colo.	Dec. 11	Jan. 6	0.01
Missoula Copper, Ida.	Oct. 4	Dec. 6	0.01
Potosi, Nev.	Nov. 12	Dec. 6	0.10
San Antonia Copper, Mex.	Dec. 1	.....	1.00
Savage, Nev.	Nov. 10	Dec. 1	0.10
Seven Troughs Mon., Utah.	Nov. 22	Dec. 11	0.00½
Sheridan M. & M., Ida.	Nov. 20	Dec. 20	0.002
Sonora M. & M., Ida.	Nov. 20	Dec. 14	0.002
Winona, Mich.	Dec. 1	Jan. 1	1.00
Yellow Jacket, Nev.	Nov. 18	Dec. 22	0.10

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

MANUFACTURE of Alumina. Gilbert McCulloch, East St. Louis, Ill., assignor to Aluminum Company of America, Niagara Falls, N. Y., a Corporation of Pennsylvania. (U. S. No. 938,269; Oct. 26, 1909.)

MANUFACTURE—Recovery of Soda in the Manufacture of Alumina. Harry C. Peffer, East St. Louis, Ill., assignor to Aluminum Company of America, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 938,270; Oct. 26, 1909.)

METALLURGICAL PROCESS of Making Aluminum. Anson G. Betts, Troy, N. Y. (U. S. No. 938,634; Nov. 2, 1909.)

COAL AND COKE

COKE OVEN—By-Product Retort Coke Oven. Hugh Prentice, Bellevue, Penn. (U. S. No. 939,086; Nov. 2, 1909.)

COKE OVENS—Improvements in Doors for Coke Ovens and Other Furnaces. Herman J. Limberg, Gelsenkirchen, Germany. (Brit. No. 21,499 of 1908.)

COPPER

CEMENT COPPER—Improved Process for Obtaining Cement Copper. O. Frolich, Wilmersdorf, Germany. (Brit. No. 27,025 of 1908.)

EXTRACTION of Copper from Raw Unroasted Ores and Other Products. Georg Schneider, Friedeburg, Germany, assignor to Eugen Abresch, Neustadt-on-the-Hardt, Germany. (U. S. No. 937,965; Oct. 26, 1909.)

MATTE TREATMENT—Method of Separating Copper, Nickel and Other Metals from Copper-Nickel Matte. Horace L. Wells, New Haven, Conn. (U. S. No. 940,292; Nov. 16, 1909.)

MATTE TREATMENT—Recovering Hydrochloric Acid from Nickel-Chloride Solution. Horace L. Wells, New Haven, Conn. (U. S. No. 940,293; Nov. 16, 1909.)

MATTE TREATMENT—Treatment of Copper or Copper-Nickel Mattes. James T. Carrick, Johannesburg, Transvaal, assignor of one-half to Basil Stuart Pattison, Johannesburg, Transvaal. (U. S. No. 939,947; Nov. 9, 1909.)

GOLD AND SILVER

ALLOY Composed of Gold, Silver and Platinum. Edward B. Craft and Jonathan W. Harris, Hackensack, N. J., assignors to Western Electric Company, Chicago, Ill., a Corporation of Illinois. (U. S. No. 937,284; Oct. 19, 1909.)

ASSAYING—Process of Assaying for Silver. Joseph C. Hames, Goldfield, Nev. (U. S. No. 939,413; Nov. 9, 1909.)

EXTRACTION PROCESS — Improvements in Processes for Extracting Silver from its Ores. James C. Pryor, Trout Mills, North Bay, Ont. (Brit. No. 25,804 of 1908.)

FILTER—Apparatus for Filtering and Washing the Filtered Material. Albert Grothe and Herbert F. Carter, Mexico, Mexico. (U. S. No. 938,378; Oct. 26, 1909.)

STAMP-MORTAR. Martin P. Boss, San Francisco, Cal. (U. S. No. 939,208; Nov. 9, 1909.)

TUBE-MILL, etc. Povl T. Lindhard, New York, N. Y. (U. S. No. 939,044; Nov. 2, 1909.)

TUBE-MILL LINING. George H. Rotherham, Tonopah, Nev. (U. S. No. 939,637; Nov. 9, 1909.)

IRON AND STEEL

ELECTRIC FURNACE. Hermann Röchling and Wilhelm Rodenhauser, Völklingen, Germany, assignors to the Gröndal Kjellin Company, Ltd., London, Eng., a Corporation of Great Britain. (U. S. No. 939,095; Nov. 2, 1909.)

MANGANESE STEEL. Winfield S. Potter, Mahwah, N. J., assignor to Manganese Steel Rail Company, Mahwah, N. J., a Corporation of New Jersey. (U. S. No. 939,084; Nov. 2, 1909.)

MANGANESE STEEL—Treating Manganese Steel. Winfield S. Potter, New York, N. Y., assignor to Manganese Steel Rail Company, Mahwah, N. J., a Corporation of New Jersey. (U. S. No. 939,163; Nov. 2. 1909.)

OPEN-HEARTH FURNACE. Luther L. Knox, Ben Avon, and Montgomery Murray, Wilkinsburg, Penn., assignors to Keystone Furnace Construction Company, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 938,245; Oct. 26, 1909.)

REFINING—Process of Producing and Refining Steel. Frank C. Perkins, Buffalo, N. Y. (U. S. No. 937,855; Oct. 26, 1909.)

TIN

DETINNING—Process for Detinning Tin Plate Waste and the Like by Means of Chlorine. Hans von Schutz, Philosophenweg, Prussia. (Brit. Nos. 22,337 and 23,594 of 1908.)

DETINNING—Process of Recovering Tin from Waste. Albert Nodon, Bordeaux, France. (U. S. No. 940,471; Nov. 16, 1909.)

ZINC

ZINC OXIDE—Process for the Preparation of Zinc Oxide for Reduction. Herman Pape, Hamburg-Billwarder a Bille, Germany. (Brit. No. 5293 of 1909.)

MINING—GENERAL

SHAFT TUBBING—Improvements in and Relating to Tubbing for Use in Pit Sinking and Like Operations and the Method of Jointing the Same. Charles Walker, Wrexham, North Wales. (Brit. No. 20,727 of 1908.)

ORE DRESSING

CONCENTRATION — Apparatus for Concentrating Solutions. Eudo Monti, Turin, Italy. (U. S. No. 940,644; Nov. 16, 1909.)

CONCENTRATORS—Improvements in and Connected with Concentrators or Apparatus for Separating or Grading Metals, Ores and Other Substances in Wet Recovery Processes. G. L. Whitcombe, Johannesburg, Transvaal, and Agnes K. Cox, London. (Brit. No. 13,366 of 1908.)

DRY CONCENTRATION—Improvements in Apparatus for the Dry Concentration of Crushed Ores. H. G. Christian, Paris, and Thwaites Bros., Ltd., Bradford. (Brit. No. 20,615 of 1908.)

MAGENTIC ORE SEPARATOR. Wayne D. Ludwick, Seattle, Wash., assignor to Northwest Metallurgical Company, Seattle, Wash., a Corporation. (U. S. No. 939,523; Nov. 9, 1909.)

ORE SEPARATOR and Concentrator. Homer L. Orr, Georgetown, Wash. (U. S. No. 937,325; Oct. 19, 1909.)

ORE TREATMENT—Improvements Relating to the Treatment of Ores or the Like. A. A. Lockwood and M. R. A. Samuel, London, E. C. (Brit. No. 12,962 of 1908.)

SEPARATION—Improvements in and Relating to Apparatus for the Separation of Solid Material from Liquids. Wilfley Mining Machinery Co., and Frank L. Roudebush, London, E. C. (Brit. No. 23,189 of 1908.)

SEPARATION—Roasting Separation Process. Henry A. Wentworth, Newton, Mass., assignor to Huff Electrostatic Separator Company, Boston, Mass., a Corporation of Maine. (U. S. No. 938,732; Nov. 2, 1909.)

METALLURGY—GENERAL

BRIQUETTING—An Improved Process for Briquetting Ores. Wilhelm Schmacher, Osnabruck, Germany. (Brit. No. 26,851 of 1908.)

ELECTRIC SMELTING—Art of Electric Smelting. Edward R. Taylor, Penn Yan, N. Y. (U. S. No. 938,352; Oct. 26, 1909.)

ORE TREATMENT—Process of Obtaining Metals from Their Ores. Alexander T. Elliott and Albert Miller, Los Angeles, Cal.; said Elliott assignor to said Miller. (U. S. No. 937,293; Oct. 19, 1909.)

SMELTER SMOKE—Improvements in Apparatus for the Recovery of Metalliferous Fumes Obtained in Roasting or Smelting Ores. A. M. G. Sebillot and Louis Mauclaire, Paris. (Brit. No. 2938 of 1909.)

SULPHIDE ORE TREATMENT—Method of Chloridizing Ores. Charles A. Diehl, Cleveland, Ohio. (U. S. No. 938,044; Oct. 26, 1909.)

SULPHIDE ORE TREATMENT—Method of Treating Poor Sulphide Ores. Alfred Holdsworth, Barnsbury, London, England. (U. S. No. 938,055; Oct. 26, 1909.)

MINING MACHINERY AND APPARATUS

ELECTRIC FUSE—Priming Charge for Mines. Louis Cahüc, Neumarkt, Germany. (U. S. No. 938,553; Nov. 2, 1909.)

LAMP-HOLDING ATTACHMENT for Miners' Caps. Cecil R. Anderson, Bellevue, Penn. (U. S. No. 938,942; Nov. 2, 1909.)

MINE CARS—End-Gate for Mine-Cars. Louis F. Brubaker, Cambridge, Ohio, assignor of one-half to Michael J. Conroy, Cambridge, Ohio. (U. S. No. 939,944; Nov. 9, 1909.)

MINE-VENTILATOR. Martin T. McDonough, Beckley, W. Va. (U. S. No. 938,781; Nov. 2, 1909.)

MINER'S ELECTRIC LAMP. Hermann Remané, Berlin, Germany, assignor to Deutsche Gasglühlicht Actien Gesellschaft (Auergesellschaft), Berlin, Germany, a Corporation of Germany. (U. S. No. 939,630; Nov. 9, 1909.)

ROCK-DRILLING MACHINE or Engine. Lewis L. Scott, Joplin, Mo. (U. S. No. 937,872; Oct. 26, 1909.)

SIGNALING APPARATUS — Apparatus for Recording Bell or Like Signals, Especially Applicable to Mines. John Russell, Langlaagte, near Johannesburg, Transvaal, assignor of one-half to John Hugh Milligan, Langlaagte, Transvaal. (U. S. No. 938,516; Nov. 2, 1909.)

METALLURGICAL MACHINERY AND APPARATUS

AGITATING DEVICES—Improvements in and Relating to Agitating Devices Particularly Applicable for Use with Gritty Material. J. F. Webb and Percy Tarbutt, London. (Brit. No. 9268 of 1909.)

BLAST-FURNACE CHARGING — Mechanical Charging Apparatus for Blast-Furnaces. Léon Geuze, Trith St. Léger, France. (U. S. No. 938,572; Nov. 2, 1909.)

ELECTRIC SMELTING FURNACE. Edward R. Taylor, Penn Yan, N. Y. (U. S. No. 938,351; Oct. 26, 1909.)

FURNACE DOORS—Improvements in or Relating to Bottom Dumping or Discharging Doors for Furnaces or Cupolas. James Hyslop, Harvey, Ill. (Brit. No. 11,818 of 1909.)

FURNACES—Improvements in Furnaces for the Treatment of Metals, Metallic Ores and Alloys. E. T. Fennell, Woolwich, and John Sackett, Charlton, Kent. (Brit. No. 22,412 of 1908.)

ORE-ROASTING FURNACES—Rabble for Ore-Roasting Furnaces. Arthur V. Leggo, St. Kilda, Victoria, Australia. (U. S. No. 940,537; Nov. 16, 1909.)

REGENERATIVE REVERSING-FURNACE. Luther L. Knox, Ben Avon, Penn., assignor to Keystone Furnace Construction Company, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. Nos. 938,246 and 938,246; Oct. 26, 1909.)

ROASTING AND LIKE FURNACE. Utley Wedge, Ardmore, Penn. (U. S. No. 939,880; Nov. 9, 1909.)

ROASTING FURNACE. Arthur R. Wilfley, Denver, Colo., assignor of one-half to Joseph Seep, Oil City, Penn. (U. S. No. 939,936; Nov. 9, 1909.)

ROASTING FURNACE. Utley Wedge, Ardmore, Penn. (U. S. No. 939,881; Nov. 9, 1909.)

SMELTING FURNACES—Improvements in and Relating to Smelting Furnaces. Société Anonyme d'Exploration des Brevets Cubilot A. Baillot, Paris, France. (Brit. No. 22,082 of 1908.)

TAPPING-FURNACE. George O. Seward, Holcombs Rock, Va., assignor, by mesne assignments, to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 940,561; Nov. 16, 1909.)